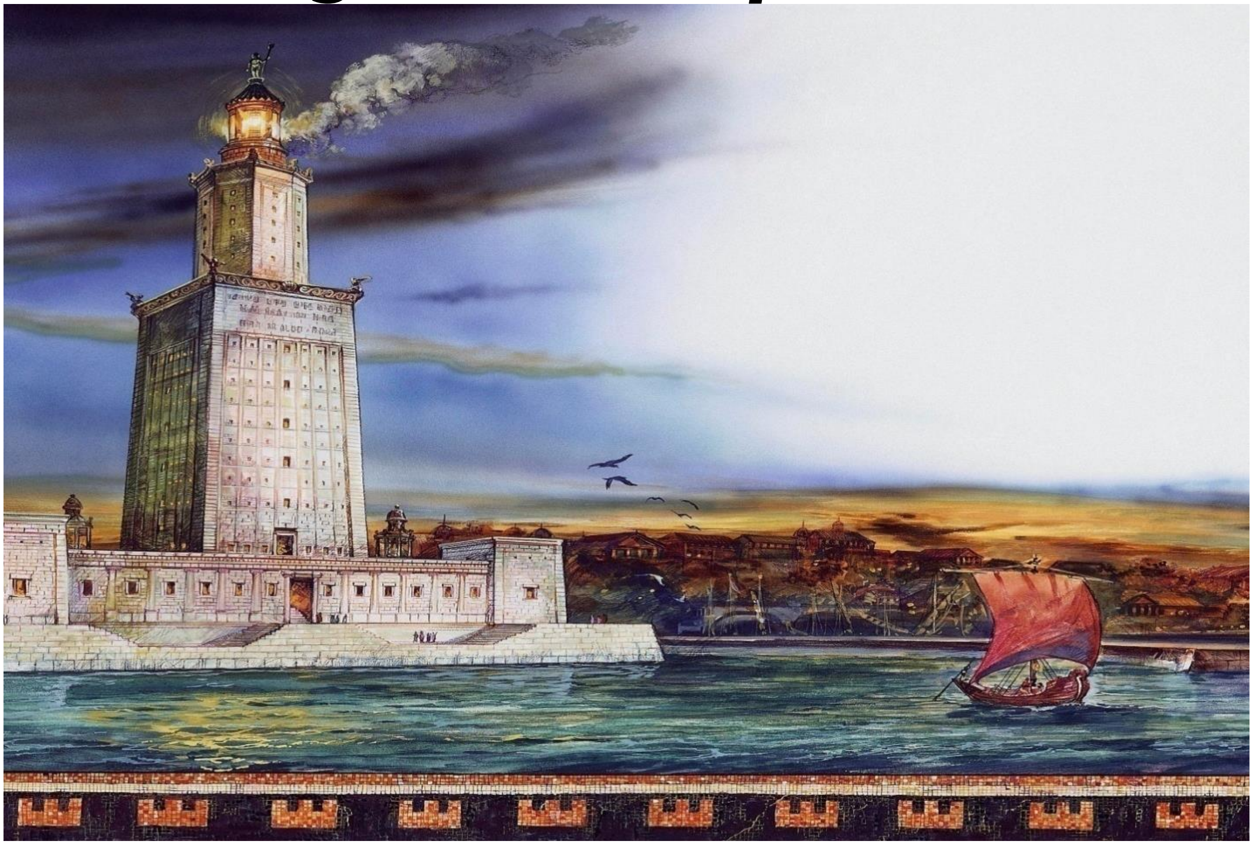
المنـــارة

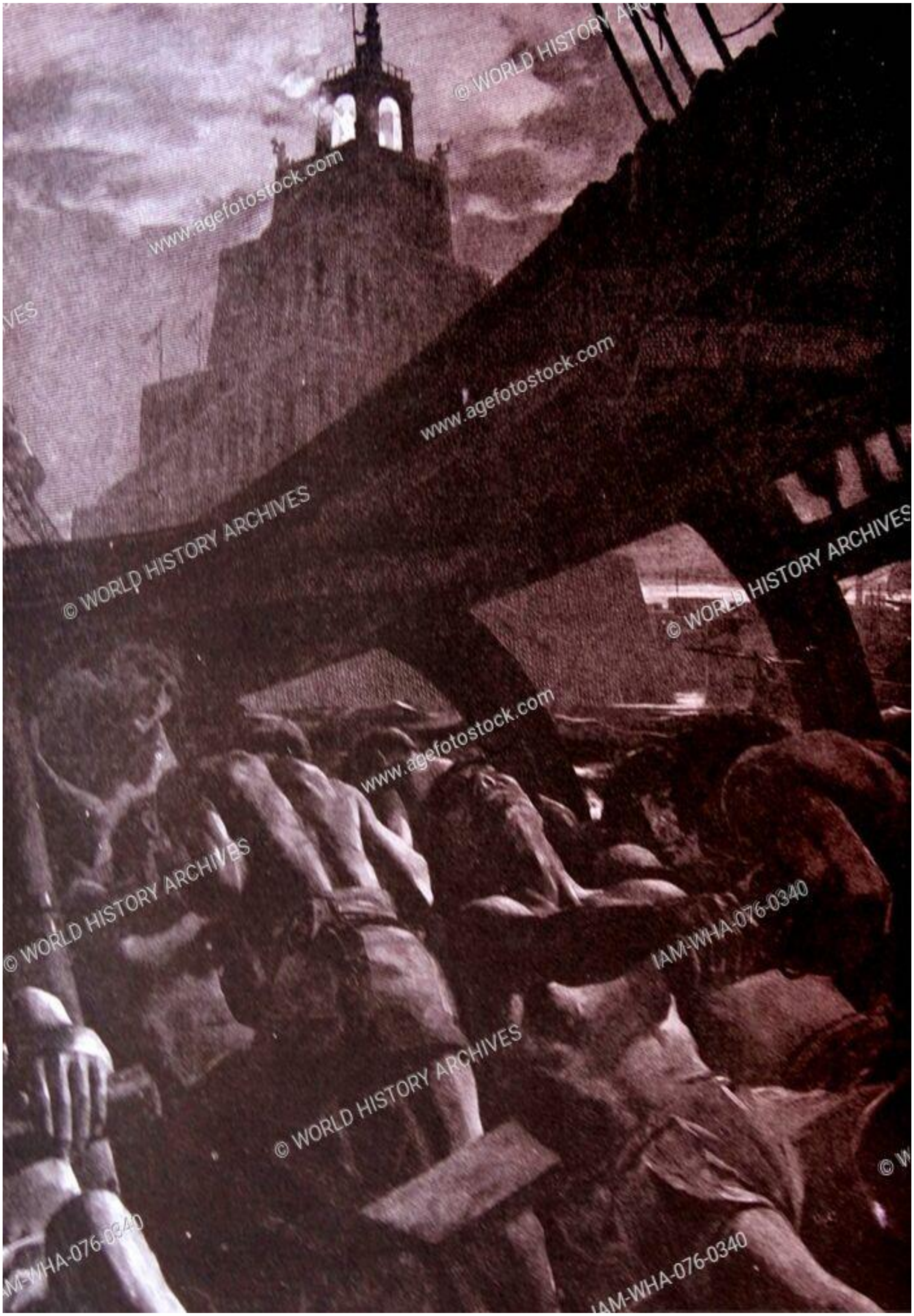
Al-Manarah

The Lighthouse of Alexandria



Dr. Uday Dokras

B.Sc., B.A. (managerial economics)
LL.B. Nagpur University, INDIA
Graduate Studies, Queen's University, Kingston, CANADA
MBA CALSATATE USA
Graduate Diploma in Law, Stockholm University, SWEDEN
Ph.D. Stockholm University, SWEDEN
CONSULTANT Human Resource and Administration



© WORLD HISTORY ARCHIVES
www.agefotostock.com
IAM-WHA-076-0340

The Lighthouse of Alexandria

Dr. Uday Dokras

B.Sc., B.A. (managerial economics)
LL.B. Nagpur University, INDIA
Graduate Studies, Queen's University, Kingston, CANADA
MBA CALSATATE USA
Graduate Diploma in Law, Stockholm University, SWEDEN
Ph.D. Stockholm University, SWEDEN
CONSULTANT Human Resource and Administration

With 2 special papers by eminent writers on the Lighthouse

Indo Swedish Author's Collective, Stockholm SWEDEN and Nagpur INDIA

PUBLISHED BY

Den Bästa

Indo Swedish Author’s Collective, Stockholm, Sweden and Nagpur, India

Dedication written to commemorate the inauguration of the Light House at Pharos, Alexandria

"The Greeks' saviour god—O mighty Proteus—shines from Pharos thanks to Sostratus of Cnidos, son of Dexiphanes. For Egypt has no cliffs or mountains as the islands do but a breakwater, level with the ground, welcomes her ships. And so this tower cutting through the breadth and depth of heaven beacons to the farthest distances by day, and all night long the sailors borne on the waves will see the great flame blazing from its top—nor miss his aim: though he run to the Bull's Horn, he'll find Zeus the Saviour, sailing, Proteus, by this beam" (CXV).AD 1223 app.

Posidippus, who resided at court, wrote an epigram commemorating the occasion, calling upon Proteus, the deity of the island.

Indo Swedish Author's Collective, Stockholm SWEDEN and Nagpur INDIA

First Edition 2020

Copyright 2020 Uday Dokras. All Rights Reserved. No part of this publication may be reproduced, stored in a retrieval system, transmitted in any form or by means of electronic, mechanical, photocopy, micro-film, recording or otherwise, without prior permission of the copyright holder.

ISBN No. applied for. Cost US $150. I N R 1500/- Euro 120

ACKNOWLEDGMENTS

To all my Greek friends in Stockholm, especially Ionnidis who used to call me "Allesando"
and Dragon of Thessalonikki.
I may be no Alexander, but I sure can write about him.
Thanks for kindling my interest in this amazing country and its warmhearted people.

> **"Small opportunities are often the beginning of great enterprises."**
> ***– Demosthenes***

This is my opportunity and it is duly seized.

Were weapons used on the enemies from the Tower that led to its destruction? Read my Chapter on the secret weapons of the Greeks

How this book is structured

There is an ancient Greek Proverb-“ Whatever is good to know is difficult to learn.”
It is good to know about the Lighthouse, but there is very little to learn since its destruction nearly 2000 years ago and the obliteration of its ruins.
What I have done is my own version of the Light house, interjected with 2 detailed papers on Ancient Alexandria and the light house reproduced ad- verbatim for the benefit of you-my reader.

Strangely, there are 100’s of pictures, etchings drawings, digital art on the Net. It underlines the fact that the structure did ignite the imagination of the many who drew(and still does). Unfortunately, there were few who wrote and even fewer who spoke. Hence SILENCE.

But let these, my words, speak of this remarkable structure. So mysterious, yet one that inspires so much curiosity and amazement. Enjoy, dear reader, enjoy.

C O N T E N T S

Acknowledgment Page 7

How this book is structured page 8

Chapter I Legacies page 11

Chapter II The Architecture of Alexandria Lighthouse page 62

Chapter III The History of Alexandria page 96

Chapter IV The Harbour page 106

Chapter V The Fall of the Tower Page 124

Chapter VI The Lighthouse as a wonder of the world page 141

Chapter VII The lighthouse of Alexandria by Lucien Augé de Lassus (1878) page 152

Chapter VIII THE LIGHTHOUSE OF PHAROS: A NARRATIVE-By Curt Baker page 169

Chapter IX Weapons at the Tower Page 184

About the Author Page 204

CHAPTER I

LEGACIES

After its construction by Alexander the Great, the city of Alexandria quickly became the center of Greek learning. Under the rule of Ptolemy I the city became both a well of knowledge and extremely prosperous harbor. However, the city needed both a symbol and a mechanism to guide the many trade ships into the busy harbor. Thus Ptolemy authorized the building of the Pharos(as the Light House will be called off and on in this Book) in 290 B.C., and when it was completed some twenty years later, it was the first lighthouse in the world and the tallest building in existence, with the exception of the Great Pyramid.

Description

The lighthouse was built on an island off the coast of Alexandria called Pharos. Its name, legend says, is a variation of Pharaoh's Island. The island was connected to the mainland by means of a dike - the Heptastadion - which gave the city a double harbor. The lighthouse was constructed of marble blocks with lead mortar and was composed of three stages: The lowest square, 55.9 m (183.4 ft) high with a cylindrical core; the middle octagonal with a side length of 18.30 m (60.0 ft) and a height of 27.45 m (90.1 ft); and the third circular 7.30 m (24.0 ft) high. The total height of the building including the foundation base was about 117 m (384 ft), the same as a 40-story modern building. On top of the tower was a cylinder that extended up to an open cupola where where the fire that provided the light burned. On the roof of the cupola was a large statue of Poseidon, while the lower portion of the building contained hundreds of storage rooms. The interior of the upper two sections had a shaft with a dumbwaiter that was used to transport fuel up to the fire. Staircases allowed visitors and the keepers to climb to the beacon chamber. There, according to reports, a large curved mirror, perhaps made of polished metal, was used to project the fire's light into a beam. It was said ships could detect the light from the tower at night or the smoke from the fire during the day up to one-hundred miles away. The lighthouse's designer was a famous architect, Sostrates of Knidos. Legend states that being proud of his work, Sostrates, desired to have his name carved into the foundation. Ptolemy II, the son who ruled Egypt after his father, refused this request wanting his own name to be the only one on the building. Sostrates had the inscription: SOSTRATES SON OF DEXIPHANES OF KNIDOS ON BEHALF OF ALL MARINERS TO THE SAVIOR GODS chiseled into the foundation, then covered it with plaster. Into the plaster was chiseled Ptolemy's name. As the years went by the plaster aged and chipped away revealing Sostrates' declaration.

How long did it take to construct: The Lighthouse of Alexandria, sometimes called the Pharos of Alexandria, was a lighthouse built by the Ptolemaic Kingdom between 280 and 247 BC which has been estimated to be 100 metres in overall height. One of the Seven Wonders of the Ancient World, for many centuries it was one of the tallest man-made structures in the world. Badly damaged by three earthquakes between AD 956 and 1323, it then became an abandoned ruin. It was the third longest surviving ancient wonder (after the Mausoleum at Halicarnassus and the extant Great Pyramid of Giza) until 1480, when the last of its remnant stones were used to build the Citadel of Qaitbay on the site. In 1994, French archaeologists discovered some remains of the lighthouse on the floor of Alexandria's Eastern Harbour. The Ministry of State of Antiquities in Egypt has planned, as of late 2015, to turn submerged ruins of ancient Alexandria, including those of the Pharos, into an underwater museum.
he lighthouse was constructed in the 3rd century BC. After Alexander the Great died, the first Ptolemy (Ptolemy I Soter) announced himself king in 305 BC, and commissioned its construction shortly thereafter. The building was finished during the reign of his son, the second Ptolemy (Ptolemy II Philadelphus). It took twelve years to complete, at a total cost of 800 talents, and served as a prototype for all later lighthouses in the world. The light was produced by a furnace at the top, and the tower was said to have been built mostly with solid blocks of limestone.

Strabo reported that Sostratus had a dedication inscribed in metal letters to the "Saviour Gods". Later Pliny the Elder wrote that Sostratus was the architect, which is disputed. In the second century AD the satirist Lucian wrote that Sostratus inscribed his name under plaster bearing the name of Ptolemy. This was so that when the plaster with Ptolemy's name fell off, Sostratus's name would be visible in the stone.There are numerous rumors as to how the lighthouse fell. One story states that the lighthouse was demolished through trickery. In 850 A.D. the Emperor of Constantinople, a rival port, devised a clever plot to get rid of the Pharos. He spread rumors that buried under the lighthouse was a fabulous treasure. When the Caliph at Cairo who controlled Alexandria heard these rumors, he ordered that the tower be pulled down to get at the treasure. It was only after the great mirror had been destroyed and the top two portions of the tower removed that the Caliph realized he'd been deceived. He tried to rebuild the tower, but couldn't, so he turned it into a mosque instead. This story, however, is hard to believe since there are texts stating that the lighthouse was still up and running in 1115 A.D. thus it couldn't have been destroyed in 850. The most likely cause of the collapse was that in AD 956, an earthquake shook Alexandria, but caused little damage to the Lighthouse. It was later in 1303 and in 1323 that two stronger earthquakes causes the structure to collapse, sinking into the ocean. Finally in 1480 A.D. when the Egyptian Mamelouk Sultan, Qaitbay, decided to fortify Alexandria's defense, he built a medieval fort on the same spot where the Lighthouse once stood, using the fallen stone and marble.[1]

Scholars have called the Lighthouse of Alexandria the only practical wonder since it served a utilitarian purpose. We have plenty of information about it, but some are conflicting accounts. The story of the lighthouse begins with Alexander the Great.

According to Plutarch, Alexander had a dream in which he was told to seek the small island of Pharos, located just off the coast of ancient Egypt. He chose Ptolemy I Soter, one of his army's generals, to settle the island. Ptolemy decided that Pharos needed something to identify it, both symbolically and literally -- its coast was difficult to navigate.

Some scholars credit the idea for the lighthouse to Ptolemy and others attribute it to the mouseion, a governmental brain trust [source: Smithsonian]. Around 285 B.C., construction began. A man named Sostrates of Knidos was instrumental to the process. By some accounts, he was the financial backer for the project -- the lighthouse cost about 800 talents, bars of silver, equal to roughly three million dollars [source: Princeton]. Other accounts identify him as the lighthouse's architect.

Even if we can't be sure of the lighthouse's architect, we are certain of its architecture. It was built with marble and mortar and composed of three stories. The first level was rectangular, the second octagonal and the third cylindrical. Perched atop the third story was a statue -- either of Zeus or Poseidon, god of the sea. Records from Moorish travelers in the tenth century A.D. say that the lighthouse was 300 cubits high, which converts to about 450 feet (137 meters).A spiral ramp led to its entrance. Carts and workhorses could be led up to the first level to the hundreds of storage rooms. To access the upper levels, one had to use the spiral staircase. Dumbwaiters lifted supplies to the highest tower.

German sculptors work on a sand replica of the pharos during a sand sculpting competition in

Ships could supposedly see the lighthouse from a hundred miles away [source: PharosLighthouse.org]. During the day, light was reflected from the sun with a concave metal disc; at night, light came from a bonfire, fueled by firewood or dried animal dung. The lighthouse survived through more than 22 earthquakes before it came toppling down in 1303. The people of Pharos loved their lighthouse dearly -- it was a source of power and revenue for the island. They attempted to repair and restore the lighthouse throughout the ninth and thirteenth centuries when it became clear that it could no longer be saved.

Today, a fort stands on its site. The identity of Pharos became so enmeshed with the lighthouse that the lighthouse became alternately known as the Pharos of Alexandria. "Pharos" is also the root of the word "lighthouse" in several languages. And our knowledge of the lighthouse continues to grow after a 1994 archaeological scuba expedition found sunken remnants of the lighthouse.

LASTING LEGACY

Supposedly, Sostrates was so proud of his creation that he asked to inscribe his name on the lighthouse. Ptolemy II, who had succeeded his father by the project's completion, refused Sostrates' request. Sostrates inscribed his name anyway and covered it with a plaster inscription bearing Ptolemy's name. Over time, the plaster weathered away, revealing his legacy.[2] The Alexandria Lighthouse was built by the Ptolemaic Kingdom sometime between 280 and 247 BC.

The **Ptolemaic cult of Alexander the Great** was an imperial cult in ancient Egypt in the Hellenistic period (323–31 BC),[3] promoted by the Ptolemaic dynasty. The core of the cult was the worship of the deified conqueror-king Alexander the Great, which eventually formed the basis for the ruler cult of the Ptolemies themselves. The head priest of the cult was the chief priest in the Ptolemaic Kingdom, and years were dated after the incumbents (eponymous priests).

Followng the death of Alexander the Great in 323 BC, his empire fell apart in the wars of the Diadochi (his generals, the Diadochi or "Successors"). One of them, Ptolemy, son of Lagos, secured rule of Egypt and made it the base for his own imperial ambitions. To legitimize his rule as Ptolemy I Soter (r. 323–282 BC), he relied, like the other Diadochi, not only on the right of conquest, but also on the supposed legitimate succession of Alexander. Not only did Ptolemy I portray himself as Alexander's closest friend in his historical work, but in 321 BC, he seized his body while Alexander's funeral procession was on its way to Macedon from Babylon, and brought it to the Egyptian capital at Memphis. This claim was particularly useful in Egypt, where Alexander had been greeted as liberator from the Achaemenid Empire (the so-called "Twenty-seventh Dynasty") and had been enthroned as Pharaoh and son of the deity Ammon-Ra, receiving divine honours. During his stay in Egypt, Alexander had also laid the foundations for the city of Alexandria, which became the main Greek colony and capital of the country.

In the new Ptolemaic Kingdom, the Hellenic element (Macedonians and people from Greek city-states), to which the Ptolemaic dynasty itself belonged, formed the ruling class which succeeded the native Egyptian Pharaohs. While sacred kingship had long been practised in Egypt and other eastern nations, it was almost unheard-of in the Greek world. Driven by his unprecedented conquests, in the last year of his life Alexander had demanded even from his Greek subjects to be treated as a living god (*apotheōsis*). This was accepted only reluctantly, and often rejected outright, by the Greek cities, but Alexander's prolific founding of cities alone secured for him a divine status there, since Greek cities traditionally rendered their founder divine honours. When Ptolemy took over Egypt, he incorporated the heritage of Alexander into his own propaganda to support the claims of his own dynasty. As part of this effort, Alexander was elevated from a simple patron god of Alexandria to the status of a state god for the Greek populations of the entire Ptolemaic empire, even beyond the confines of Egypt.

Alexander as God: During the early Ptolemaic dynasty (c. 290 BC), Ptolemy I began the construction of the Tomb of Alexander the Great in Alexandria (the σῆμα, *sēma*), and appointed a priest (ἱερεύς, *hiereus*) to conduct religious rites there. This office quickly advanced to become the highest priesthood in the Ptolemaic Kingdom, its prominence underscored by its eponymous character, i.e., each regnal year was named after the incumbent priest, and documents, whether in Koine Greek or Demotic Egyptian, were dated after him. The first priest of Alexander was no less a figure than Ptolemy I's brother Menelaos. The tenure lasted one year, but under Ptolemy I, the priests apparently held the post for longer tenures, while under his successors, with few exceptions, the tenures were reduced to a single year.

Under Ptolemy II Philadelphus (r. 282–246 BC), Alexander's body was brought to the *sēma*, and, in contrast to the usual Greek custom of cremation, was entombed in a magnificent golden sarcophagus, which was eventually replaced by a transparent glass coffin to display his preserved body. Not only did the presence of Alexander's body in the Ptolemaic capital enhance the dynasty's prestige, but it also became one of the main attractions and pilgrimage sites in the ancient Mediterranean. Even Roman emperors made the journey to Alexandria to visit the great conqueror's tomb.

The Ptolemies assigned the deified Alexander a prominent place in the Greek pantheon, associating him with the Twelve Olympians like Zeus and Apollo. Accordingly, in documents Alexander was referred to simply by his name, as the epithet *theos* ("god") was regarded as superfluous.

While Ptolemy I Soter founded the imperial cult of Alexander, his son and successor Ptolemy II completed its connection to the ruler cult around the reigning dynasty itself. The cult of the Ptolemies began in 283/2 BC, when the deceased parents of Ptolemy II were deified as the "Saviour Gods". Statues of the deified couple were installed in the Temple of Alexander, and the priest of the Alexander cult took over the rites for the deified Ptolemies as well. With this gesture, the Ptolemies underlined the superior position of Alexander, and their own subordination to him as "temple-sharing gods" (σύνναοι θεοί, *synnanoi theoi*). Alexander remained the main recipient of rituals and sacrifices, with the Ptolemies only partaking in them.

The elevation of Alexander over the Ptolemies, and their connection to him, was further deepened through the expansion of the cult. Thus in 269 BC, the female priestly office of "basket bearer" for the "Sibling Goddess" (*thea adelphos*) Arsinoe II was established, followed in 211 BC by the "prize-bearer" priestess (*athlophoros*) in honour of the "Benefactor Goddess" (*thea euergetis*), Berenice II, and in 199 BC by a priestess for the "Father-Loving Goddess" (*thea philopatōr*), Arsinoe III. All these priesthoods were subordinate to the priest of Alexander.

Cleopatra III added three further female priesthoods for her own personal cult as "Benefactor and Mother-Loving Goddess" (*thea euergetis philometōr*): the "sacred foal" (*hieros pōlos*), the "crown bearer" (*stephanēphoros*), and the "light bearer" (*phōsphoros*). The concept of "temple-sharing gods" was underlined under Ptolemy IV Philopator (r. 221–204 BC), who translated the remains of the Ptolemies and their consorts—unlike Alexander, they had been cremated and kept in urns—to the *sēma*.

Ptolemy, son of Castor, is the last priest of Alexander known by name, before the position was merged into the royal office. Since the priesthood of Alexander is first attested in the royal titulature in the second year of the joint reign of Ptolemy IX and Cleopatra III (116/115 BC), it is unclear whether the merge of the offices took place in the last two years of Ptolemy VII's rule, or with the accession of his successors. It is possible that the merger was done at the initiative of Ptolemy IX, as part of an effort to emphasize his precedence over his co-ruling mother, Cleopatra III. As such, the office changed its role and character, from an eponymous priesthood to a propaganda tool: unlike the royal office, which was increasingly shared among siblings or other family members from the early 2nd century BC on, the priesthood of Alexander was indivisible. This must have appealed to Ptolemy IX, eager to set himself apart from his mother, who he hated and who had begun her own priestly cult around her own person.

This new role of the priesthood of Alexander can be traced in later reigns as well. In the first months of 112/111 BC, an ordinary citizen, Artemidorus, occupied the office. He was probably a partisan of Cleopatra III, who had succeeded to temporarily evict her son from Alexandria. As women could not occupy a supreme priesthood in the Greek world, she had to content herself with placing one of her supporters in the post, as a public sign of her new dominance. After Artemidorus, however, the name of Ptolemy IX was subsequently added in the papyrus, which means that he managed to return to Alexandria in the same year.

In 107 BC, Cleopatra III managed to expel Ptolemy IX for good from Alexandria, and raised her second son, Ptolemy X, to the throne as her co-ruler and priest of Alexander. As the inter-dynastic rivalry continued, however, in 105 BC she finally decided to assume the priesthood herself, to underline her precedence. Cleopatra probably intended this arrangement to be permanent, but her blatant violation of Greek norms in assuming the priesthood must have damaged her image among the Greeks. The last years of her reign were taken up with her persistent conflict with Ptolemy IX, until she died in 101 BC, probably following an assassination attempt by Ptolemy IX, whereupon Ptolemy X became sole ruler. The priestly and royal offices remained united under Ptolemy X and his successors, although the priestly title was rarely mentioned in the papyri, as the loss of its eponymous character rendered it irrelevant for dating purposes.

The **Lighthouse of Alexandria** was built on the island of Pharos outside the harbours of Alexandria, Egypt c. 300 - 280 BCE, during the reigns of Ptolemy I and II. With a height of over 100 metres (330 ft), it was so impressive that it made it onto the established list of the Seven Wonders of the Ancient World. Although now lost, the structure's lasting legacy, after standing for over 1600 years, is that it gave its Greek name '*Pharos*' to the architectural genre of any tower with a light designed to guide mariners. Perhaps influencing later Arab minaret architecture and certainly creating a whole host of copycat structures in harbours around the Mediterranean, the lighthouse was, after the pyramids of Giza, the tallest structure in the world built by human hands.

Alexandria

Alexandria in Egypt was founded by Alexander the Great in 331 BCE, and thanks to its two natural harbours on the Nile Delta, the city prospered as a trading port under the Ptolemaic dynasty (305-30 BCE) and throughout antiquity. A cosmopolitan city with citizens from all over the Greek world, the city had its own assembly and coinage and became a renowned centre of learning.

The Light house was intended to guide and protect sailors and therefore dedicated to the Greek God- the DELIVERER. Around 300 BCE Ptolemy I Soter (r. 323 - 282 BCE) commissioned the building of a massive lighthouse to guide ships into Alexandria and provide a permanent reminder of his power and greatness. The project was completed some 20 years later by his son and successor Ptolemy II (r. 285-246 BCE). The structure only added to the impressive list of things to see at the great city which included the tomb of Alexander, the Museum (an institution for scholars), the Serapeum temple, and the magnificent library.

The Lighthouse

According to several ancient sources, the lighthouse was the work of the architect Sostratus of Cnidus, but he may have been the project’s financial backer. The structure was located on the very tip of the limestone islet of Pharos facing the harbours of Alexandria. These two natural harbours were the Great Harbour and the whimsically named Eunostos or 'Harbour of Fortunate Return'. The mainland was linked to the island of Pharos by a causeway, the Heptastadion, which measured around 1,2 km (0.75 miles). The lighthouse, we are informed by a contemporary writer named Poseidippos, was intended to guide and protect sailors and to that end was dedicated to two gods, Zeus Soter (Deliverer) - whose dedicatory inscription on the tower was made with half-metre high letters - and possibly Proteus, the Greek sea god, also known as the 'Old man of the Sea'.

The lighthouse at Alexandria was certainly not the first such aid to ancient mariners but it was probably the first monumental one. Thasos, the north Aegean island, for example, was known to have had a tower-lighthouse in the Archaic period, and beacons and landmarks were widely used by cities to help sailors across the Mediterranean. Ancient lighthouses were built primarily as navigational aids for where a harbour was located rather than as a warning of hazardous shallows or submerged rocks, although, because of the dangerous waters of Alexandria’s harbour, the Pharos performed both functions.

Strabo (c. 64 BCE - c. 24 CE), the Greek geographer and traveller made the following observations on Pharos:

> *This extremity itself of the island is a rock, washed by the sea on all sides, with a tower upon it of the same name as the island, admirably constructed of white marble, with several stories. Sostratus of Cnidus, a friend of the kings, erected it for the safety of mariners, as the inscription imports. For as the coast on each side is low and without harbours, with reefs and shallows, an elevated and conspicuous* ***mark*** *was required to enable navigators coming in from the open sea to direct their course exactly to the entrance of the harbour. (Geography, 17.1*)

The exact design of the lighthouse, unfortunately, is not made clear by ancient writers, with descriptions often being vague, confusing, and conflicting. Most sources do agree that the tower was white (making it more visible) and that it had three floors - the lowest being rectangular, the middle one octagonal, and the top one round. Also (mostly) agreed upon is the presence of a statue of Zeus Soter on the top. Later Arab writers describe a ramp rising around the outside of the lower part of the tower and an internal staircase to reach the upper levels. Modern historians have debated the height of the tower, and estimates range from 100 to 140 metres (330-460 ft), which would, in any case, have made the Pharos the second tallest architectural structure in the world after the pyramids at Giza.

A fire, likely burning oil as wood was scarce, was kept at the top of the tower to make it visible at night, but whether this was so from the outset is debated by historians, largely because the earliest references to the Pharos in the works of ancient writers make no mention at all of a light. Later sources do describe the Pharos as a lighthouse and not merely a landmark tower useful only during daylight. The flame and several other points regarding the lighthouse are mentioned in the following description by the 1st-century CE Roman writer Pliny the Elder:

The cost of its erection was eight hundred talents, they say; and, not to omit the magnanimity that was shown by King Ptolemæus on this occasion, he gave permission to the architect, Sostratus of Cnidos, to inscribe his name upon the edifice itself. The object of it is, by the light of its fires at night, to give warning to ships, of the neighbouring shoals, and to point out to them the entrance of the harbour. (*Natural History,* 36.18)

According to later Arab sources, there was even a mirror (presumably of polished bronze) to reflect the flame over a greater distance out to sea. The mirror may also have functioned as a reflector of the sun. The tower, with no light visible, appears on Roman imperial coinage of the city (from Domitian to Commodus, 81-192 CE), which clearly show a large, narrow-windowed tower topped with a monumental statue and two smaller figures of Triton blowing a conch shell. These coins show the entrance to the tower being at the very base while later Arab descriptions have it higher up. The Pharos also appeared in mosaics and sarcophagi throughout antiquity, confirming its wide fame.

Some of the monuments of the ancient world so impressed visitors from far and wide with their beauty, artistic and architectural ambition, and sheer scale that their reputation grew as 'must-see' (*themata*) sights for the ancient traveller and pilgrim. Seven such monuments became the original 'bucket list' when ancient writers such as Herodotus, Callimachus of Cyrene, Antipater of Sidon, and Philo of Byzantium compiled shortlists of the most wonderful sights of the ancient world. The Lighthouse of Alexandria made it onto the established list of Seven Wonders, albeit rather later than the others, because it was such a tall and unique structure. The tower’s design was copied to protect harbours and mariners throughout the ancient world, and it became so famous as a lighthouse that the term *pharos* has been applied ever since to any such tower intended to aid shipping, and it is still the word for a lighthouse in many modern languages.

Alexandria continued to prosper as part of the Roman empire, being the second most important city in the Roman world and the most important port in the eastern Mediterranean. Earthquakes, especially in 796 CE, 950 CE - with a partial collapse six years later - 1303 CE and 1323 CE, badly damaged the

Lighthouse of Alexandria over the centuries, but there are records of regular repairs and extensions. For example, a domed mosque was added to the top part c. 1000 CE and a major reconstruction occurred c. 1161 CE under the Fatimids. Some historians suggest that the tower had an influence on Arab minaret architecture, and it is interesting to note that the Arabic word for minaret and lighthouse is the same: *al-Manarah*.

The lighthouse disappears from the historical record after the 14th century CE, presumably finally toppled by another earthquake sometime in the 1330s CE. The tower's granite foundations were reused in the Qait Bey Fort, built in the 15th century CE. Modern marine archaeology in the area - the sea level has risen since antiquity - has revealed several stone fragments and two monumental figures of Ptolemy I and his queen, Berenice, which may well have once belonged to the tower and its immediate vicinity.

Finally, as an interesting footnote, the Lighthouse of Alexandria might have been a much-copied veritable wonder but it was not always successful in helping mariners as marine archaeologists have discovered over 40 wrecks in the area of the ancient harbour of Alexandria. On the other hand, who can say how many more disasters there would have been without the great lighthouse guiding ships safely into the port?

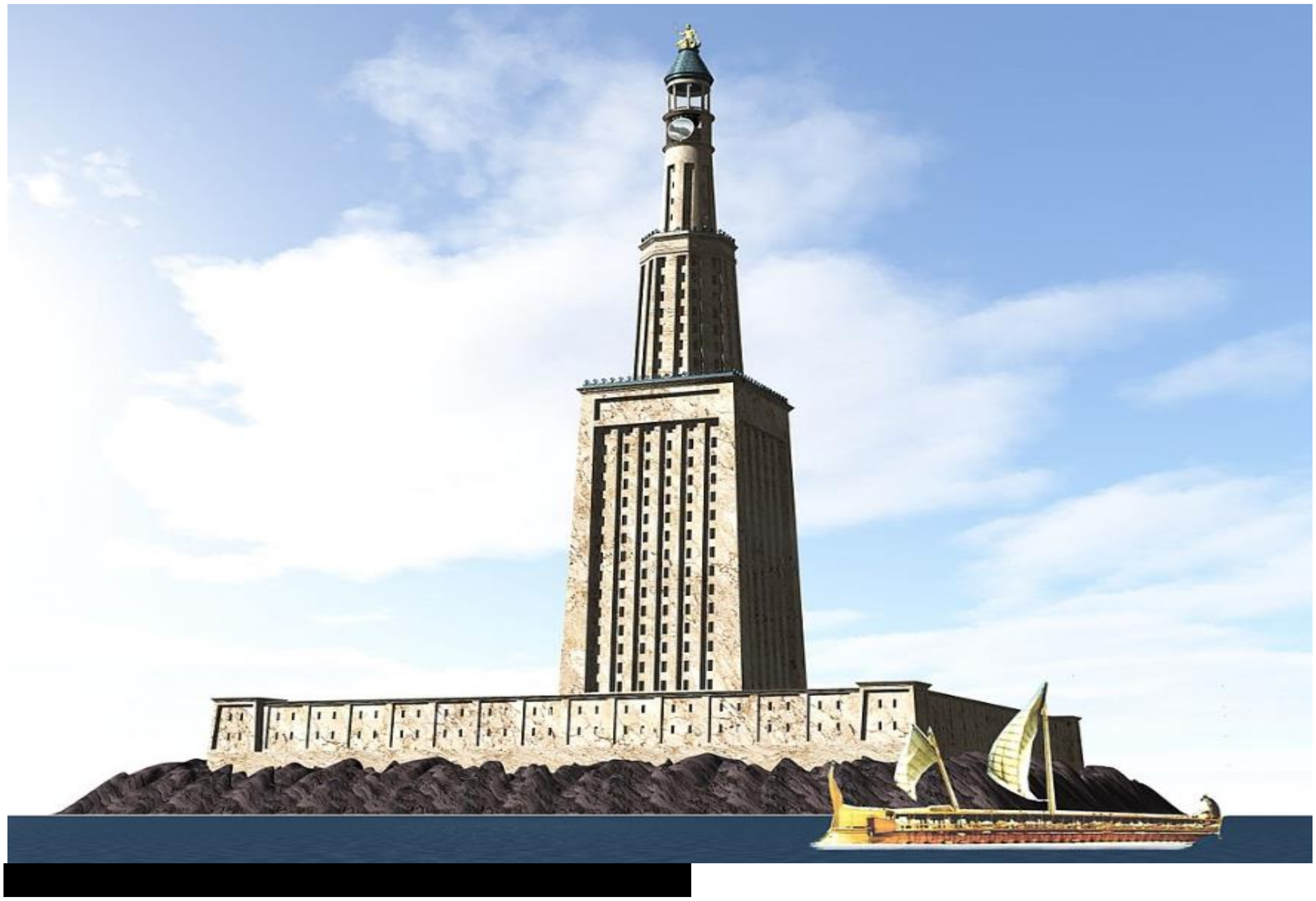
Facts About The Lighthouse Of Alexandria

Egypt has an amazing history and is known for its Pyramids. It is considered to be one of the 7 wonders of the ancient world, the second from Egypt along with the Great Pyramid of Giza.

1. When was the Lighthouse of Alexandria Built?

Alexander the Great had founded the city of Alexandria in 332 B.C. It’s one of the 17 cities he founded but only one of the few that remained. After he died in 323 B.C. the first king of the Ptolemaic Kingdom named Ptolemy I Soter made himself king in 305 B.C. his also marks the start of the Ptolemaic Kingdom, which ended with the death of Cleopatra and the Roman conquest of 30 B.C.

The construction of the Lighthouse of Alexandria started around 290 B.C**.** and took nearly 12 years to complete.



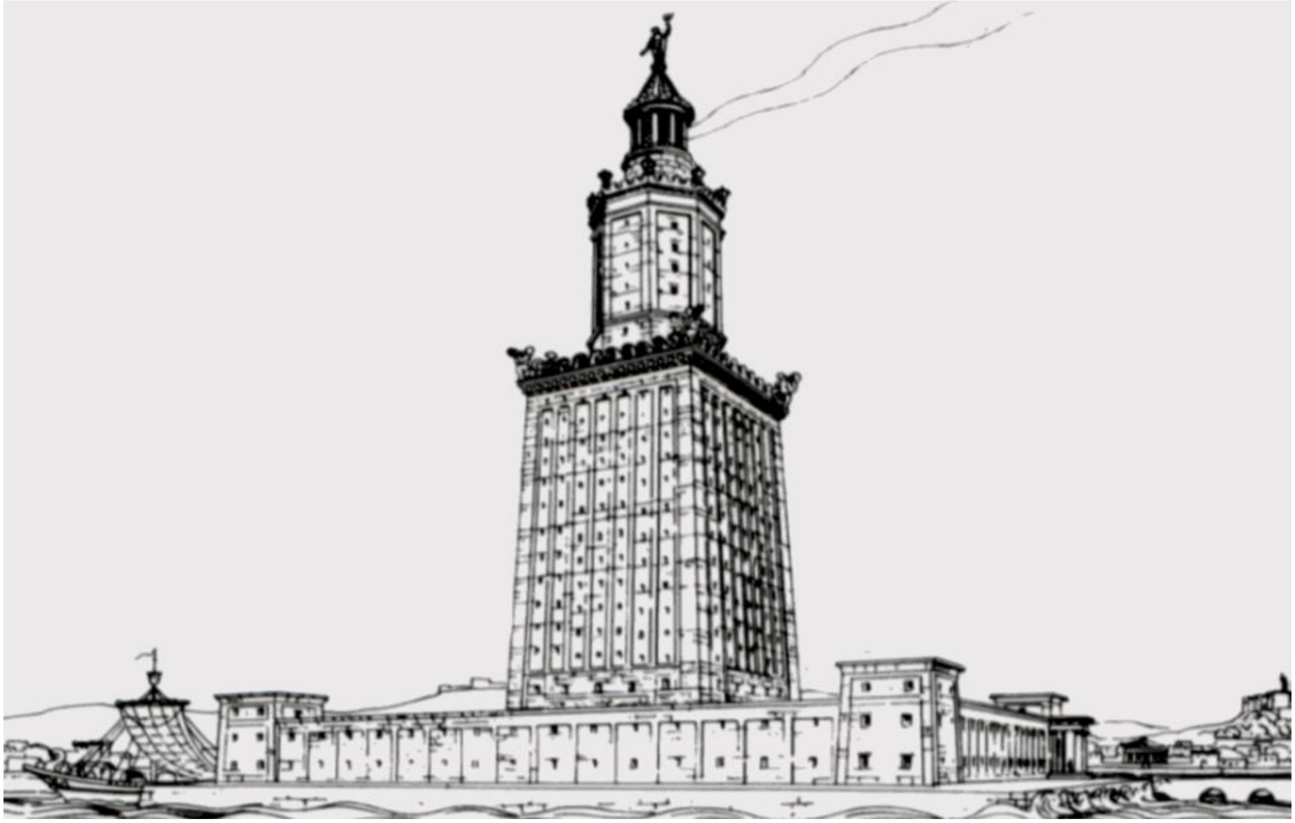
[redacted]

2. How was the Lighthouse of Alexandria constructed?

Even though Ptolemaic king Ptolemy I Soter commissioned the construction of the Lighthouse of Alexandria, it wasn’t finished under his reign.The building was finished under the reign of his son, Ptolemy II Philadelphus, who was the pharaoh of Ptolemaic Egypt for 37 years from 283 to 246 B.C.

3. How big was the Lighthouse of Alexandria? Even though the Lighthouse of Alexandria underwent a lot of restorations, heights from contemporary sources don’t vary too much.

In one of the clearest descriptions of the lighthouse written in 1166 A.D. by Arab traveler Abou Haggag Youssef Ibn Mohammed el-Balawi el-Andaloussi, it’s mentioned that the base of the lighthouse was 30 meters (98 ft) long on all sides. s to the height of the lighthouse, all estimates point towards the fact that the lighthouse was over 100 meters high (330 ft), **between 103 and 118 meters** to be exact



A sketch from the lighthouse made by German archeologist Prof. H. Thiersch in 1909 / Wiki Commons

3. How was the Lighthouse of Alexandria destroyed?

The Lighthouse of Alexandria was located in the vicinity of 2 fault lines, the African-Arabian and the Red Sea rift fault lines. This made it prone to earthquakes.A series of earthquakes have caused the Lighthouse of Alexandria to be destroyed and eventually collapse.The first series of earthquakes happened in 796 and 951 and caused major damage. The first structural collapse, making the top 20 meters of the building fall over, happened in a very severe earthquake in 956.Nevertheless, the lighthouse was rebuilt and an Islamic dome was integrated replacing the statue that used to be on top of the lighthouse before.

The most severe earthquake happened in 1303 with an estimated intensity of 8+ on the Richter-scale, causing the final collapse.Finally, in 1477**,** the then-Sultan of Egypt built a medieval fort using the fallen stones of the lighthouse. This fort is called the “Citadel of Qaitba

More interesting facts about the Lighthouse of Alexandria

4. The Lighthouse of Alexandria, also known as the Pharos of Alexandria, was the first lighthouse ever built in the entire world.

5. While today we have the Burj Khalifa as the tallest man-made structure in the world, the lighthouse of Alexandria held the title of being the second-tallest made structure in the world for numerous centuries. The only taller structure built by people was the Great Pyramid of Giza, also located in Egypt near the modern city of Caïro.

Citadel of Qaitbay / CarstenW / https://creativecommons.org/licenses/by/3.0

6. The Lighthouse of Alexandria is considered to be one of the 7 wonders of the ancient world and the third-longest surviving one. Only the Mausoleum at Halicarnassus and the Pyramid of Giza, the only one that still exists today.

7. The reason the lighthouse of Alexandria was built, just as with any other lighthouse, was to safely guide sailors into the port since it was believed the inhabitants of Pharos were wreckers. Being the first to ever have such a powerful navigation system in place, it also allowed the city of Alexandria to become one of the most important cities of its time.

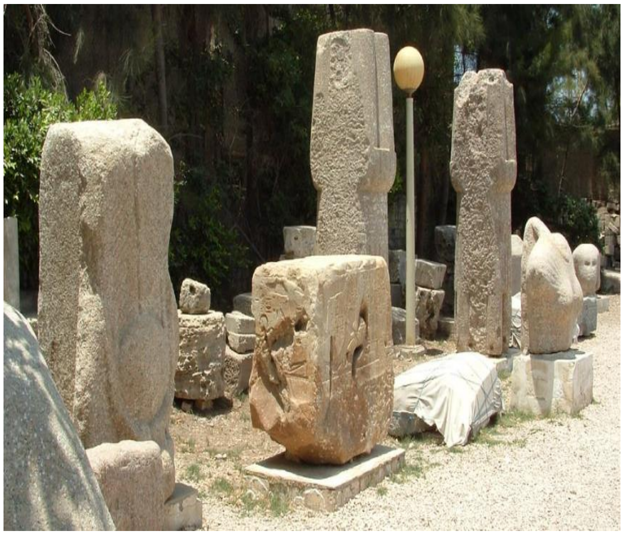
8. The total cost to build the Lighthouse of Alexandria was 800 talents of silver, the currency used at that time. In today's currency, we can estimate that this is about **$**3 million**.**

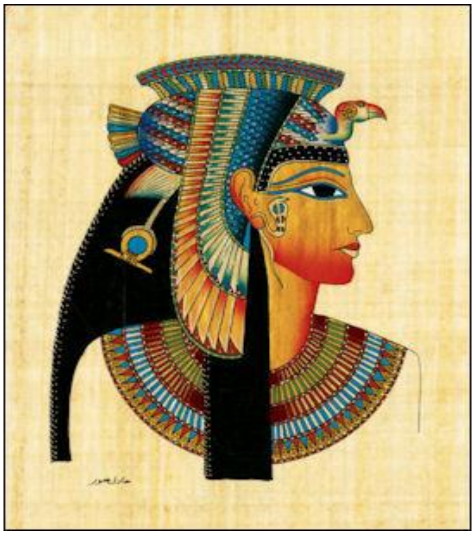
9. To give you a better idea of how enormous the amount was back in those days, 800 talents were the equivalent of 23,000 kilos of silver and it was nearly 10% of the treasury Ptolemy I owned the moment he started his reign.

10. If we compare this amount to another structure, the famous Parthenon temple in Athens in Greece, the massive temple part of the Acropolis, only cost about 469 talents of silver**.**

11. The place the Lighthouse of Alexandria was built was on a little island named "Pharos." This was located on the western edge of the Nile Delta, one of the largest river deltas in the world.

12. The city of Alexandria was founded on the opposite side of the island of Pharos on what is called an **"**Isthmus," a narrow stretch of land connecting two larger areas that would otherwise be separated by water**.**





Remains of the tower salvaged from the sea Cleopatra was a Greek Ptolemy.

PTOLEMIES (330-30 B.C.): The Greco-Roman Period in Egypt (332 B.C. to A.D. 395) began when the Persians were defeated by Alexander the Great in the early forth century B.C. When Alexander died his kingdom was divided. One of generals, Ptolemy took over Egypt. His descendants ruled Egypt until the death of Cleopatra. Cleopatra was the only Ptolemy who learned to speak Egyptian.

Ptolemy I was a Macedonian. His successors were the the royal family of Egypt. The Macedonian-Greek dynasty (the Ptolemies) he founded ruled Egypt for more than 300 years. There were 15 Ptolemic leaders and they ruled from 332 B.C. to 30 B.C. from Alexandria. Cleopatra was the last of the Ptolemies. When she died in 30 B.C., Romans took over territory formally controlled by the Ptolemies.

The Ptolemic period was a time of great learning. In Egypt, Greek physicians taught the study of human anatomy. In Babylon Greek physicists developed a method to electroplate silver to copper. The Ptolemies brought Greek culture to Egypt and made Alexandria the center of Greek culture. Greek was the language of the court and the bureaucracy. Most of the nobility was made up of Greeks, few of whom bothered to learn the Egyptian language. The Ptolemies didn't trust the local Egyptians so they recruited native Greeks to be soldiers, bureaucrats, administrators. They also encouraged thousands of Greeks to pack up their bags and abandon their homeland in favor of Egypt.

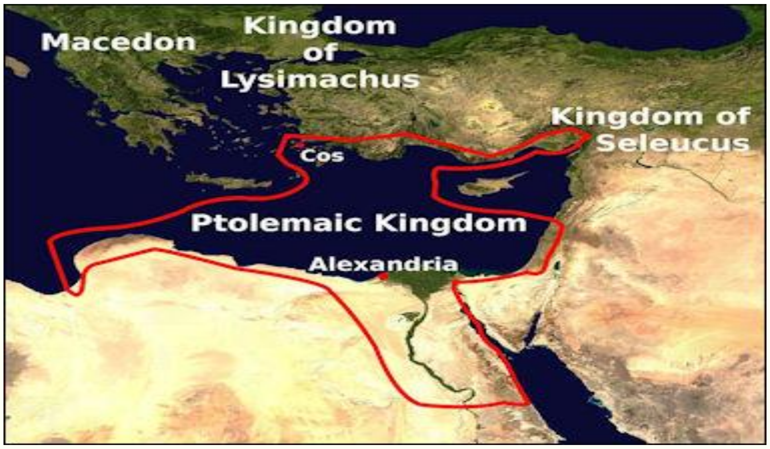
Chip Brown wrote in National Geographic, “The Ptolemies of Macedonia are one of history's most flamboyant dynasties, famous not only for wealth and wisdom but also for bloody rivalries and the sort of "family values" that modern-day exponents of the phrase would surely disavow, seeing as they included incest and fratricide.

"The Ptolemies came to power after the conquest of Egypt by Alexander the Great, who in a caffeinated burst of activity beginning in 332 B.C. swept through Lower Egypt, displaced the hated Persian occupiers, and was hailed by the Egyptians as a divine liberator. He was recognized as pharaoh in the capital, Memphis. Along a strip of land between the Mediterranean and Lake Mareotis he laid out a blueprint for Alexandria, which would serve as Egypt's capital for nearly a thousand years.

"The dynasty's greatest legacy was Alexandria itself, with its hundred-foot-wide main avenue, its gleaming limestone colonnades, its harborside palaces and temples overseen by a towering lighthouse, one of the seven wonders of the ancient world, on the island of Pharos. Alexandria soon became the largest, most sophisticated city on the planet. It was a teeming cosmopolitan mix of Egyptians, Greeks, Jews, Romans, Nubians, and other peoples. The best and brightest of the Mediterranean world came to study at the Mouseion, the world's first academy, and at the great Alexandria library.

"The Ptolemies' talent for intrigue was exceeded only by their flair for pageantry. If descriptions of the first dynastic festival of the Ptolemies around 280 B.C. are accurate, the party would cost millions of dollars today. The parade was a phantasmagoria of music, incense, blizzards of doves, camels laden with cinnamon, elephants in golden slippers, bulls with gilded horns. Among the floats was a 15-foot Dionysus pouring a libation from a golden goblet."

Egypt Under Ptolemaic Rule



Ptolemaic Empire in 300BC

The Ptolemies were able to control the trade routes of the Mediterranean and the Nile Valley. During their rule Egypt prospered as more efficient agriculture was introduced and trade flourished. Ptolemic policy was generally more liberal than that of Greece or Rome. The population grew dramatically and ordinary people could enjoy pleasures once reserved for the pharaohs. The Greeks introduced coinage, which encouraged trade and the accumulation and wider distribution of wealth.

The chief god of Egypt was Serapis, an amalgam of older Greek and Egyptian deities. He had a shaggy beard and remained popular well into the Roman era. It wasn't until Christians appeared on the scene in large numbers in the A.D. 4th century that his images were widely smashed and destroyed.

According to Minnesota State University, Mankato: “In 332 B.C., Egypt was organized as a province of the new Macedonian Empire. Egypt's transition into this new era came about with Alexander the Great's conquest of Egypt and destruction of the Persians. Alexander's arrival was seen as a deliverer from Persian rule and he was accepted as a Pharaoh. He, however, did not stay long before returning to the battlefield in his campaign against the Persians. In 323 B.C., Alexander died suddenly and Ptolemy Lagus became the satrap of Egypt a short time later. In 305 B.C., Ptolemy became the king of Egypt. Under his rule Egypt assumed a new appearance with the administration being organized along Greek lines and Greek becoming the official language. This ideal stemmed into the arts and military. These affected age-old Egyptian traditions and conventions in the arts. It created an effective and efficient fighting machine in the military using Macedonian structure. In the early first century B.C. internal control slackened and in 30 B.C. with the death of Cleopatra VII and of Caesarion the Ptolemaic Dynasty ended and Egypt became a Roman province

“Religiously they introduced a long line of gods into there existing religious structure without losing the traditions. Under the Ptolemaic Period they also pursued commerce and built new ports and contacts with Asia. The construction of the library of Alexandria was a memorial to their enthusiastic patrons of learning. Like most educated people the Mediterranean after the conquest of Alexander, the Ptolemies, spoke a 'universal' (koine) form of Greek; originally they came with Alexander from Macedonia, in the north of Greece, which like most regions of that country, had a distinct dialect.

Rulers from the Greek and Ptolemaic Periods: After Alexander the Great
Macedonian Period (332–304 B.C.)

Alexander the Great (332–323 B.C.)

Philip Arrhidaeus (323–316 B.C.)

Alexander IV (316–304 B.C.)

[Source (Department of Egyptian Art, The Metropolitan Museum of Art, October 2002]

Pharos Lighthouse, one of the Seven Wonders of the World, was created under the Ptolemies in Alexandria

Ptolemaic Period (304–30 B.C.)

Ptolemy I Soter I (304–284 B.C.)

Ptolemy II Philadelphos (285–246 B.C.

Arsinoe II (278–270 B.C.)

Ptolemy III Euergetes I (246–221 B.C.)

Berenike II (246–221 B.C.)
Ptolemy IV Philopator (222–205 B.C.)
Ptolemy V Epiphanes (205–180 B.C.)
Harwennefer (205–199 B.C.)
Ankhwennefer (199–186 B.C.)
Cleopatra I (194–176 B.C.)
Ptolemy VI Philometor (180–145 B.C.)
Cleopatra II (175–115 B.C.)
Ptolemy VIII Euergetes II (170–116 B.C.)
Harsiese ((ca. 130 B.C.)
Ptolemy VII Neos Philopator (145–144 B.C.)
Cleopatra III (142–101 B.C.)
Ptolemy IX Soter II (116–80 B.C.)
Ptolemy X Alexander I (107–88 B.C.)
Ptolemy XI Alexander II (80–80 B.C.)
Ptolemy XII Neos Dionysos (80–51 B.C.)
Cleopatra IV Berenike III ((ca. 79 B.C.)
Berenike IV (58–55 B.C.)
Ptolemy XIII (51–47 B.C.)
Cleopatra VII (51–30 B.C.)
Ptolemy XIV (47–44 B.C.)
Ptolemy XV (44–30 B.C.)
Roman Period (30 B.C."364 A.D.)
Augustus (30–14 B.C.)
Byzantine Period 364–476 A.D.

Early Ptolemies

Cleomenes of Naucratis: Appointed by Alexander the Great in the spring of 331 B.C., originally as Alexander's collector of revenues in the satrap of Egypt. Not a Ptolemaic ruler, Cleomenes was the antecedent of the House of Ptolemy and leader of Egypt by default after Alexander's death in 323 B.C. [Source: House of Ptolemy, “Ptolemaic Chronology” by Alan Edouard Samuel."

Ptolemy I Soter

Ptolemy I (also known as Ptolemy, Son of Lagos; Ptolemy Soter)in the Satrap of Egypt under Philip Arrhideus: 323 - 317 B.C.with Cleomenes as assistant (hyparchos): 323 B.C.

under Alexander IV: 317 - 311 B.C.given epithet Soter

305 B.C. November 7 Soter takes title of king, Ptolemy I (Soter I)

Elevation and joint rule with Philadelphos:

Wives: Eurydice B.C., Berenice I

282 B.C., between January 7 and summer death of Soter

284 B.C., January beginning of joint regency of Soter and Philadelphus

Ptolemy II (Philadelphus)

Wives: Arsinoe I B.C., Arsinoe II

246 B.C., January 29 death of Philadelphus B.C., accession of Euergetes I

Ptolemy III (Euergetes I)

Wife: Berenice II

222 B.C., between October 18 and December 31 death of Euergetes I B.C., accession of Philopator I

Ptolemy IV (Philopator I)

210 B.C., 9 October Birth of Ptolemy V Epiphanes

210 B.C., November 30 Elevation of Epiphanes as coregent with his father Philometor

205 B.C., after October18 B.C., possibly November 28 death of Philopator

204 B.C., between summer and September 8 accession of Epiphanes

Ptolemy V (Epiphanes)

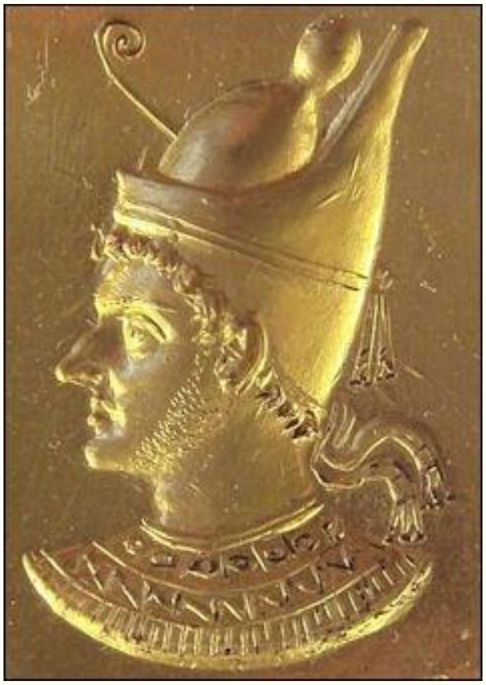
Wife: Cleopatra I

197 B.C., November 26 Anakleiteria of Epiphanes

196 B.C., March 27 Rosetta Stone inscribed

180 B.C., between February 20 and October 6 death of Epiphanes and accession of Philometor

Middle Ptolemies



Ptolemy VI Philometor

Ptolemy VI (Philometor)

regency under Cleopatra I: 180-176 B.C.

1st Sole reign: 176 - 170 B.C.

Joint reign with Ptolemy VIII 169-164 B.C.

Invasion of Antiochus IV of Syria: 169 & 168 B.C.

2nd Sole reign with Cleopatra II: 164/3-145 B.C.

Wife: Cleopatra II

176 B.C., between April 8 and October 14 death of Cleopatra I B.C., Philometor ruling B.C., married to his sister

170 B.C., October 5 beginning of joint regency of Philometor B.C., Euergetes II B.C., and Cleopatra II

164 B.C., October expulsion of Philometor

163 B.C., before May 29 return of Philometor

145 B.C., spring association of Neos Philopator on the throne

145 B.C., before September 19 death of Philometor B.C., accession of Euergetes II

Ptolemy VII (Neos Philopator)

associated ruler with his father Philometor: 145/144

regent under his uncle Euergetes II and mother Cleopatra II (who married): 14 B.C.

Ptolemy VIII (Euergetes II) "Physkon" restored

King of Cyrenaica B.C., Libya 163-145 B.C.

145 - 116

Wives: Cleopatra II B.C., Cleopatra III

131-130 revolution of Cleopatra II

116 B.C., June 28 death of Euergetes II

116 B.C., after October 29 116 B.C., death of Cleopatra II

Cleopatra III and

Ptolemy IX (Soter II) "Lathyrus" Ruler in Cyrenaica B.C., Libya: 115 - 104/1 B.C.

“Wife: Cleopatra III

115 B.C., before April 6 establishment of Cleopatra III with Soter II

110 B.C., before October 31 expulsion of Soter II B.C., Alexander I on the throne

109 B.C., before February 2 return of Soter II

108 B.C., between March 10 and May 28 second interruption of Soter's reign by Alexander I

Cleopatra III and Ptolemy X (Alexander I)

Ruler in Cyprus: 114/3 - 105/4 B.C.

“Ptolemy X (Alexander I) and Cleopatra Berenice

Wife: Cleopatra Berenice

107 B.C., before November 15 B.C., probably before September 19 expulsion of Soter

101 B.C., before October 26 death of Cleopatra III

88 B.C., soon before September 14 death of Alexander I B.C., return of Soter II

Ptolemy XI (Philometor Soter II) "Lathyrus"

restored (2nd B.C.

Wife: Cleopatra III

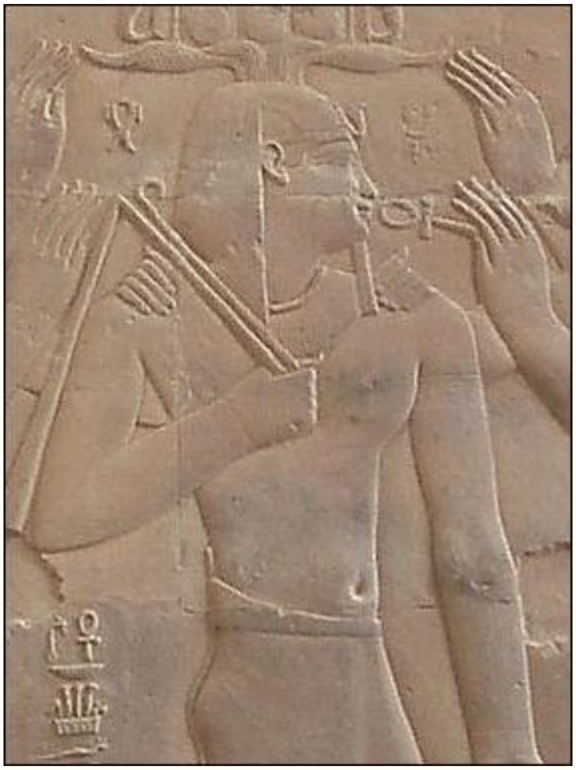
80 B.C., March death of Soter II

80 B.C. Cleopatra Berenice ruled for 6 months

succeeded by Alexander II B.C., who ruled for 19 days

80 B.C., before September 11 accession of Auletes

Late Ptolemies



Ptolemy XII

Ptolemy XII (Neos Dionysus) "Auletes

Wife: Cleopatra Berenice

58 B.C., after September 7 departure of Auletes from Egypt

Berenice IV

at first with Cleopatra Tryphaena

afterwards with Archelaus

57 B.C., before July 11 Berenice IV and Cleopatra Tryphaena on the throne

56 B.C., between February 1 and April 16 Archelaus married to Berenice IV

55 B.C., before April 22 return of Auletes

Ptolemy XII (Neos Dionysus)

"Auletes" B.C., res B.C.

52 B.C., September 5 association of Cleopatra VII and Ptolemy XIII with Auletes on the throne

51 B.C., between ca. February 1 and March 22 death of Auletes

Cleopatra VII (Philopator Nea Thea)

with Ptolemy XIII (Philopator): 52/1-47 B.C.

with Ptolemy XIV (Philopator): 47-44 B.C.

sole reign: 44-36 B.C.

coregency with Ptolemy XV (Caesar Philopator Philometor "Caesarion"): 36-30 involvement with Julius

Caesar: 48 to 44 B.C.

involvement with Marc Antony: 41-30 B.C.

47 B.C., before January 15 death of Ptolemy XIII

44 B.C., between July and 2 September death of Ptolemy XIV

41 B.C. Caesarion temporarily on the throne

36 B.C. beginning of joint regency of Cleopatra & Caesarion

30 B.C., August 3 capture of Alexandria by Octavian

30 B.C., August 12 death of Cleopatra

30 B.C., August 31 beginning of Augustus' reign

Alexander the Great

According to Minnesota State University, Mankato: Alexander III, King of Macedonia, was the first king to be called "the Great". The son of Philip II and Olympias, Alexander was born in 356 B.C. He was taught by Aristotle and had a love for the works of Homer. Alexander became the King of Macedonia in 336 B.C. upon his father's death. He took up his father's war of aggression against Persia, adopting his slogan of a "Hellenic Crusade" against the barbarians. He defeated the small force defending Anatolia, proclaiming freedom for the Greek Cities, while keeping them under tight control. After a campaign through the Anatolian highlands (to impress the tribesmen), he met and defeated the Persian army under Darius III at Issue (near modern Iskenderun, Turkey). He occupied Syria and after a long siege of Tyre, Phoenicia, Alexander then entered Egypt, where he was accepted as pharaoh. He died in June 323 B.C.

Alexander received a hero's welcome in Egypt, an unhappy vassal of Persia for nearly 200 years. In Memphis, the Egyptian capital, Alexander was recognized as a pharaoh. Hieroglyphics of Alexander's adventures adorn temples in Luxor.

Perhaps the greatest achievement of Alexander's military campaign was the founding of Alexandria. Arrian wrote that "he himself designed the general layout of the new town, indicating the position of the market square, the number of temples...and the precise limits of its outer defenses." After Alexander died, Alexandria grew into the center of Hellenistic Greece and was the greatest city for 300 years in Europe and the Mediterranean.

In 331 B.C., Alexander the Great trekked 300 miles across the Sahara desert for no military reason to Siwa Oasis (near Libyan border), where he met with the oracle at the Zeus-Amum temple and asked questions about his future and divinity. The oracle greeted Alexander as the son of Amun-Re and gave him the favorable omens he wanted for an invasion of Asia. The 24-year-old Alexander arrived at Siwa by camel. He asked the oracle whether was the son of Zeus. He never revealed the answer to that question.

Ptolemy I

Ptolemy I-Soter (304-283 B.C.) took control of Egypt after Alexander the Great died. He was an ambitious self-made Macedonian general who served under Alexander and was also known as Ptolemy the savior. Ptolemy was crowned pharaoh in 304 B.C. on the anniversary of Alexander's death. He made offerings to the Egyptian gods, took an Egyptian throne name, and portrayed himself in pharaonic garb.

Ptolemy I was King of Egypt from 323 to 283 B.C. and the founder of the Ptolemic Dynasty. He distinguished himself as a trustworthy friend and ally and able troop commander under Alexander. During the council at Babylon, that followed Alexander's death, he proposed that the huge territory conquered by Alexander be divided into provinces ruled his generals. He was awarded Egypt and became its governor and then its king and secured Egypt's borders against external enemies. Ptolemy I is sometimes called

Enriched by Alexander's conquest in Asia and money earned from trade, Ptolemy I went on an unprecedented building spree. He inaugurated the great library of Alexandria and is believed to have planned the Pharos Lighthouse. He built many impressive temples, colonnaded streets, public baths and a massive gymnasium. He founded a the Mouseion, research institute with lecture halls, laboratories and guest room for visiting scholars, Archimedes and Euclid all worked there as did Aruistarchus of Samos who determined the sun was the center of solar system and the planets circled around it.

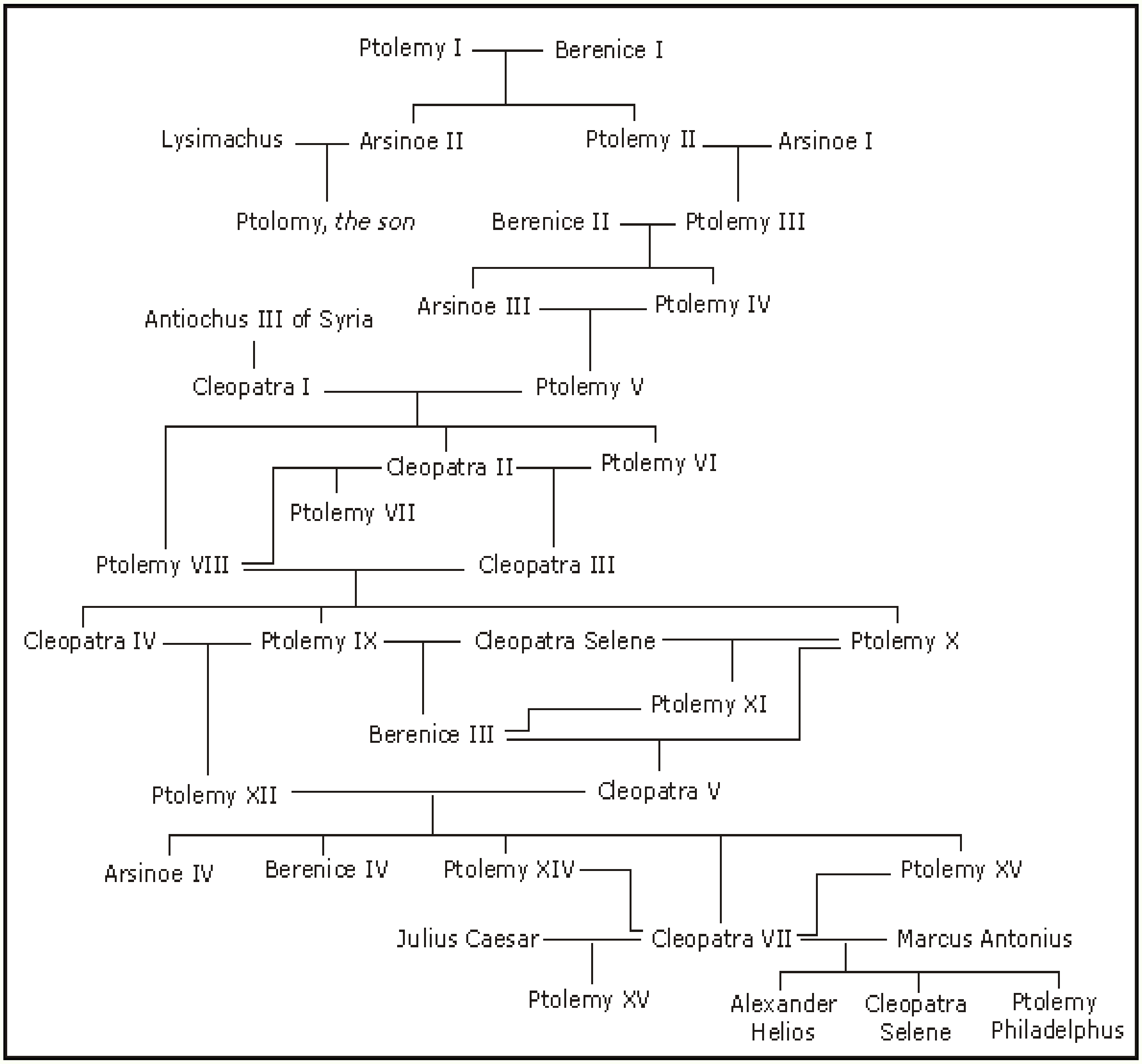
Ptolemy I made Alexandria the capital and cultural center of his kingdom. He gained the goodwill of the Egyptian people by restoring their temples and rituals, which had been destroyed and outlawed by the Persians and made gifts to the Egyptian gods, nobility and priestly caste. He also founded the Museum (Mouseion), a common workplace for scholars and artists, and established the famous library at Alexandria.

Ptolemy I and Alexander the Great

Ptolemy I was a Macedonian general and friend of Alexander since his early days. He served with Alexander from his first campaigns, and was the first ruler of the Ptolemy dynasty. He played a principal part in the campaigns in Afghanistan and India and participated in the Battle of Issus, commanding troops on the left wing under the authority of Parmenion. He accompanied Alexander during his journey to the Oracle in the Siwa Oasis and commanded the campaign that captured the rebel Bessus. During Alexander's campaign in the Indian subcontinent, Ptolemy was in command of the advance guard at the siege of Aornos and fought at the Battle of the Hydaspes River.

Pausanias wrote in “Description of Greece”, Book I: Attica (A.D. 160):“The Macedonians consider Ptolemy to be the son of Philip, the son of Amyntas, though putatively the son of Lagus, asserting that his mother was with child when she was married to Lagus by Philip. And among the distinguished acts of Ptolemy in Asia they mention that it was he who, of Alexander's companions, was foremost in succoring him when in danger among the Oxydracae. When Alexander died Ptolemy somehow got his hands of Alexander's embalmed corpse (some say he stole it as it was being shipped back to Macedonia for burial). The body had been embalmed with honey. Ptolemy put the corpse in class coffin and had it displayed to the public.

Ptolemy brought Alexander's body to the northern coat of Egypt to shore up his claim on the region and boost his legitimacy. Ptolemy made Alexander's tomb into one of the world's first major tourist attractions and through it brought recognition to Alexandria. The corpse was exhibited in an elaborate mausoleum much as the bodies of Lenin and Mao are displayed in class cases in Moscow and Beijing. Tourist reportedly formed long lines to glimpse the famous Macedonian general's embalmed body. The body is thought to have remained there for six centuries and is thought to have maybe disappeared in riots in the A.D. 3rd century.



Egyptian Ptolemies

Ptolemy I After the Death of Alexander the Great

The account which follows deals with the troubled period which came after the death of Alexander the Great in 323 B.C. The generals Antigonus, Ptolemy, Seleucus, Lysimachus and Cassander quarrelled over the division of the empire. Pausanias wrote in “Description of Greece”, Book I: Attica (A.D. 160): “After the death of Alexander, by withstanding those who would have conferred all his empire upon Aridaeus, the son of Philip, he became chiefly responsible for the division of the various nations into the kingdoms. He crossed over to Egypt in person, and killed Cleomenes, whom Alexander had appointed satrap of that country, considering him a friend of Perdiccas, and therefore not faithful to himself; and the Macedonians who had been entrusted with the task of carrying the corpse of Alexander to Aegae, he persuaded to hand it over to him. And he proceeded to bury it with Macedonian rites in Memphis, but, knowing that Perdiccas would make war, he kept Egypt garrisoned. And Perdiccas took Aridaeus, son of Philip, and the boy Alexander, whom Roxana, daughter of Oxyartes, had borne to Alexander, to lend color to the campaign, but really he was plotting to take from Ptolemy his kingdom in Egypt. But being expelled from Egypt, and having lost his reputation as a soldier, and being in other respects unpopular with the Macedonians, he was put to death by his body guard

“The death of Perdiccas immediately raised Ptolemy to power, who both reduced the Syrians and Phoenicia, and also welcomed Seleucus, son of Antiochus, who was in exile, having been expelled by Antigonus; he further himself prepared to attack Antigonus. He prevailed on Cassander, son of Anti pater, and Lysimachus, who was king in Thrace, to join in the war, urging that Seleucus was in exile and that the growth of the power of Antigonus was dangerous to them all. For a time Antigonus pre pared for war, and was by no means confident of the issue; but on learning that the revolt of Cyrene had called Ptolemy to Libya, he immediately reduced the Syrians and Phoenicians by a sudden inroad, handed them over to Demetrius, his son, a man who for all his youth had already a reputation for good sense, and went down to the Hellespont. But he led his army back without crossing, on hearing that Demetrius had been overcome by Ptolemy in battle. But Demetrius had not altogether evacuated the country before Ptolemy, and having surprised a body of Egyptians, killed a few of them. Then on the arrival of Antigonus Ptolemy did not wait for him but returned to Egypt.

“When the winter was over, Demetrius sailed to Cyprus and overcame in a naval action Menelaus, the satrap of Ptolemy, and afterwards Ptolemy him self, who had crossed to bring help. Ptolemy fled to Egypt, where he was besieged by Antigonus on land and by Demetrius with a fleet. In spite of his extreme peril Ptolemy saved his empire by making a stand with an army at Pelusium while offering resistance with warships from the river. Antigonus now abandoned all hope of reducing Egypt in the circumstances, and dispatched Demetrius against the Rhodians with a fleet and a large army, hoping, if the island were won, to use it as a base against the Egyptians. But the Rhodians displayed daring and ingenuity in the face of the besiegers, while Ptolemy helped them with all the forces he could muster. Antigonus thus failed to reduce Egypt or, later, Rhodes, and shortly afterwards he offered battle to Lysimachus, and to Cassander and the army of Seleucus, lost most of his forces, and was himself killed, having suffered most by reason of the length of the war with Eumenes. Of the kings who put down Antigonus I hold that the most wicked was Cassander, who although he had recovered the throne of Macedonia with the aid of Antigonus, nevertheless came to fight against a benefactor.

“After the death of Antigonus, Ptolemy again reduced the Syrians and Cyprus, and also restored Pyrrhus to Thesprotia on the mainland. Cyrene rebelled; but Magas, the son of Berenice (who was at this time married to Ptolemy) captured Cyrene in the fifth year of the rebellion. If this Ptolemy really was the son of Philip, son of Amyntas, he must have inherited from his father his passion for women, for, while wedded to Eurydice, the daughter of Antipater, although he had children he took a fancy to Berenice, whom Antipater had sent to Egypt with Eurydice. He fell in love with this woman and had children by her, and when his end drew near he left the kingdom of Egypt to Ptolemy (from whom the Athenians name their tribe) being the son of Berenice and not of the daughter of Antipater.

“This Ptolemy fell in love with Arsinoe, his full sister, and married her, violating herein Macedonian custom, but following that of his Egyptian subjects. Secondly he put to death his brother Argaeus, who was, it is said, plotting against him; and he it was who brought down from Memphis the corpse of Alexander. He put to death another brother also, son of Eurydice, on discovering that he was creating disaffection among the Cyprians. Then Magas, the half-brother of Ptolemy, who had been entrusted with the governorship of Cyrene by his mother Berenice--she had borne him to Philip, a Macedonians but of no note and of lowly origin--induced the people of Cyrene to revolt from Ptolemy and marched against Egypt.

“Ptolemy fortified the entrance into Egypt and awaited the attack of the Cyrenians. But while on the march Magas was in formed that the Marmaridae,a tribe of Libyan nomads, had revolted, and thereupon fell back upon Cyrene. Ptolemy resolved to pursue, but was checked owing to the following circumstance. When he was preparing to meet the attack of Magas, he engaged mercenaries, including some four thousand Gauls. Discovering that they were plotting to seize Egypt, he led them through the river to a deserted island. There they perished at one another's hands or by famine. Magas, who was married to Apame, daughter of Antiochus, son of Seleucus, persuaded Antiochus to break the treaty which his father Seleucus had made with Ptolemy and to attack Egypt.

When Antiochus resolved to attack, Ptolemy dispatched forces against all the subjects of Antiochus, freebooters to overrun the lands of the weaker, and an army to hold back the stronger, so that Antiochus never had an opportunity of attacking Egypt. I have already stated how this Ptolemy sent a fleet to help the Athenians against Antigonus and the Macedonians, but it did very little to save Athens. His children were by Arsinoe, not his sister, but the daughter of Lysimachus. His sister who had wedded him happened to die before this, leaving no issue, and there is in Egypt a district called Arsinoites after her."

Ptolemy II and Other Ptolemic Rulers

Ptolemy II

The Ptolemic leaders have been characterized as wicked, self-indulgent hedonists who basked in luxury, bragged about their lineage and neglected their subjects. They were so obsessed about their bloodline they tended to marry their brothers and sisters. Problems caused by inbreeding are thought have been dealt with by infanticide and weak sons being propped up by the sister-wives who served as co-regents. The inbreeding is thought to be behind the fleshy bodies, prominent cheekbones and hawkish noses found on Ptolemies depicted on Roman coins.

The golden age of Hellenistic Greece occurred under the rule of Ptolemy II (309-246 B.C.), also known as Philadelphus (lover of his sister). Like ancient pharaohs he married his sister to solidify his power, an idea that horrified his Greek subjects. Ptolemy II Piladelphus Ptolemy II constructed the famous lighthouse on the island of Pharos, off Alexandria, which was one of the seven wonders of the ancient world. He expanded the Alexandria Library. Eratosthenes measured the Earth's circumference under his reign, The Ptolemies also built botanical and zoological gardens for rare species.

Cleopatra I (193-167 B.C.) was the first Ptolemic queen (she is not be confused with the famous great-great-granddaughter Cleopatra VI). She ruled ably and ruthlessly. There other queens. Some of them were Selucids (Greeks from Syria).

Famed Cleopatra was actually Cleopatra VII Thea Philopator. The last pharaoh of Egypt, she was the daughter of Ptolemy XII. Cleopatra is Greek for “glory to her race." Her attempts to maintain Egypt's independence and renew its glory were doomed. All the great civilizations of the ancient Mediterranean world were now submitting to the indisputable power of Rome. Some African-American groups claim that Cleopatra was a black woman. There is this little evidence to back this up. However Ptolemy XII had a mysterious concubine who could have been black and could have given birth to Cleopatra although it is very unlikely.

Ptolemy XII was as known the “Flute Player” because of his musical talent and his ability to charms the ladies---and the boys---with his playing and his taste for things he liked to stick in his mouth. Cleopatra's great-grand father was known as Ptolemy Physkon (“Potbelly”). He reportedly paraded around in flimsy robes to show off his flab (at that time regarded as sign of wealth).

Great Spectacle and Procession of Ptolemy II (285 B.C.)

The historian William Stearns Davis wrote: “When Ptolemy II Philadelphus became king of Egypt (285 B.C.), he celebrated his accession by a magnificent procession and festival at Alexandria. The following is only a part of the description of the very elaborate spectacle. The mere enumeration of all this pomp, power and treasure conveys a striking idea of the riches of the Ptolemaic kings, the splendor of their court, and the resources of their kingdom. [Source: William Stearns Davis, “Readings in Ancient History: Illustrative Extracts from the Sources," 2 Vols., (Boston: Allyn and Bacon, 1912-1913), Vol. I: Greece and the East, pp. 329-332.

Roman-era procession for Dionysus

Around A.D. 200, Athanaeus, a Roman-era Greek rhetorician, wrote in “The Great Spectacle and Procession of Ptolemy II Philadelphus: History, Book V, Chap. 25: “First I will describe the tent prepared inside the citadel, apart from the place provided to receive the soldiers, artisans, and foreigners. For it was wonderfully beautiful, and worth talking of. Its size was such that it could accommodate one hundred and thirty couches [for banqueters] arranged in a circle. The roof was upborne on wooden pillars fifty cubits high of which four were arranged to look like palm trees. On the outside of the pillars ran a portico, adorned with a peristyle on three sides with a vaulted roof. Here it was the feasters could sit down. The interior of this was surrounded with scarlet curtains; in the middle of the space, however, were suspended strange hides of beasts, strange both for their variegated color, and their remarkable size. The part which surrounded this portico in the open air was shaded by myrtle trees and laurels, and other suitable shrubs.

“As for the whole floor, it was strewed with every kind of flower; for Egypt, thanks to its mild climate, and the fondness of its people for gardening, produces abundantly, and all the year round, those flowers which are scarce in other lands, and then come only at special seasons. Roses, white lilies, and many another flower never lack in that country. Wherefore, although this entertainment took place in midwinter, there was a show of flowers that was quite incredible to the foreigners. For flowers of which one could not easily have found enough to make one chaplet in any other city, were here in vast abundance, to make chaplets for the guests . . . and were thickly strewn over the whole floor of the tent; so as really to give the appearance of a most divine meadow.

“By the posts around the tent were placed animals carved in marble by the first artists, a full hundred in number; while in the spaces between the posts were hung pictures by the Sicyonian painters. And alternately with these were carefully selected images of every kind, and garments embroidered with gold and splendid cloaks, some having portraits of the kings of Egypt wrought upon them, and some stories from mythology. Above these were placed gold and silver shields alternately. [A long account follows of the golden couches, golden tripods, silver dishes, and lavers, jewel-set cups, etc., provided for the guests."

“And now to go on to the shows and processions exhibited; for they passed through the Stadium of the city. First of all there went the procession of Lucifer [the name given to the planet Venus] for the fˆte began at the time when that star first appears. Then came processions in honor of the several gods. In the Dionysus procession, first of all went the Sileni to keep off the multitude, some clad in purple cloaks, and some in scarlet ones. These were followed by Satyrs, bearing gilded lamps made of ivy wood. After them came images of Victory, having golden wings, and they bore in their hands incense burners, six cubits in height, adorned with branches made of ivy wood and gold, and clad in tunics embroidered with figures of animals, and they themselves also had a deal of gold ornament about them. After them followed an altar six cubits high, a double altar, all covered with gilded ivy leaves, having a crown of vine leaves upon it all in gold. Next came boys in purple tunics, bearing frankincense and myrrh, and saffron on golden dishes. And then advanced forty Satyrs, crowned with golden ivy garlands; their bodies were painted some with purple, some with vermilion, and some with other colors. They wore each a golden crown, made to imitate vine leaves and ivy leaves. Presently also came Philiscus the Poet, who was a priest of Dionysus, and with him all the artisans employed in the service of that god; and following were the Delphian tripods as prizes to the trainers of the athletes, one for the trainer of the youths, nine cubits high, the other for the trainer of the men, twelve cubits.

“The next-was a four-wheeled wagon fourteen cubits high and eight cubits wide; it was drawn by one hundred and eighty men. On it was an image of Dionysus---ten cubits high. He was pouring libations from a golden goblet, and had a purple tunic reaching to his feet. . .In front of him lay a Lacedaemonian goblet of gold, holding fifteen measures of wine, and a golden tripod, in which was a golden incense burner, and two golden bowls full of cassia and saffron; and a shade covered it round adorned with ivy and vine leaves, and all other kinds of greenery. To it were fastened chaplets and fillets, and ivy wands, drums, turbans, and actors' masks. After many other wagons came one twenty-five cubits long, and fifteen broad; and this was drawn by six hundred men. On this wagon was a sack, holding three thousand measures of wine, and consisting of leopards' skins sewn together. This sack allowed its liquor to escape, and it gradually flowed over the whole road. An endless array of similar wonders followed; also a vast number of palace servants displaying the golden vessels of the king; twenty-four chariots drawn by four elephants each; the royal menagerie---twelve chariots drawn by antelopes, fifteen by buffaloes, eight by pairs of ostriches, eight by zebras; also many mules, camels, etc., and twenty-four lions."

“After these came a procession of troops---both horsemen and footmen, all superbly armed and appointed. There were 57,600 infantry, and 23,200 cavalry. All these marched in the procession. . .all in their appointed armor. . .The cost of this great occasion was 2239 talents and 50 minae [roughly $100 million in 2018 dollars--a kingly sum for any coronation]."

Alexandria main boulevard

Arsinoe II

Arsinoë II (316-271 B.C.) was a Ptolemaic Queen and co-regent of Ancient Egypt and is regarded as the third ruler of Ptolemic Egypt. Chris Carpenter of Minnesota State University, Mankato wrote: “The story of Arsinoe II's life is much like a Greek tragic play. It is filled with death, greed, and intrigue. Arsinoe II (316-271 B.C.) was the daughter of King Ptolemy I and was married to King Lysimachus of Thrace at sixteen years of age. Now, at this time, her life was going exceptional well, she gave her husband three boys and in return she got whatever she wanted. Unfortunately, all good things come to an end.

“When her husband died, she was offered a deal by a potential second mate. If she married him, she was promised to rule Thrace. This marriage, however, was a scam. Her second husband only wanted to get close to her sons to kill them. When he had succeeded in killing two of her sons and the third fled for his life, she returned to her homeland with a plan to gain power in Egypt. When she got there however, she was welcomed by a technicality that could destroy her plan."

"King Ptolemy I, Arsinoe's father had a son (Ptolemy II) the current king of Egypt. If that is not surprisingly enough, he was married to King Lysimachus' daughter Arsinoe I (282-247 B.C.). This little discovery put as kink in her plans, but Arsinoe II started to romance and win her brother's heart. By the year 278 B.C. Ptolemy II saw his wife, Arsinoe I as a threat, and he accused her of complicity in a plot to have him killed. Consequently, she was banished to Coptos in Upper Egypt. Arsinoe II took this opportunity and shortly afterward married her brother in accordance with Egyptian royal customs. Thus fulfilling the role of stepmother and sister-in-law to Arsinoe I.

"As a result of her new-found husband, she quickly became the true ruler of the country and was a key figure in court politics. Like all devoured by power and greed, once you taste it you want more. She was given divine statues and coinage was issued in her name, but it did not stop there. She wanted to reach the status of a goddess and actively pushed Arsinoe worship to achieve this task. Throughout this whole time she never gave her husband any children due to her personal philosophy. She believed that they only grew up and plotted and executed the deaths of their parents. In the end she died at the age of forty-five, thus, leaving us to ponder what she may have arose to if she had lived longer. Ptolemy II built a shrine and had many cities named for her after death. So as you can see, the life of Arsinoe II was that of a tragic tale."

Ptolemy VI's Power Struggle with His Mother Cleopatra I

Pausanias wrote in "Description of Greece", Book I: Attica (A.D. 160): "The one called Philometor is eighth in descent from Ptolemy son of Lagus, and his surname was given him in sarcastic mockery, for we know of none of the kings who was so hated by his mother. Although he was the eldest of her children she would not allow him to be called to the throne, but prevailed on his father before the call came to send him to Cyprus. Among the reasons assigned for Cleopatra's enmity towards her son is her expectation that

Alexander the younger of her sons would prove more subservient, and this consideration induced her to urge the Egyptians to choose Alexander as king." “When the people offered opposition, she dispatched Alexander for the second time to Cyprus, ostensibly as general, but really because she wished by his means to make Ptolemy more afraid of her. Finally she covered with wounds those eunuchs she thought best disposed, and presented them to the people, making out that she was the victim of Ptolemy's machinations, and that he had treated the eunuchs in such a fashion. The people of Alexandria rushed to kill Ptolemy, and when he escaped on board a ship, made Alexander, who returned from Cyprus, their king. 1.9.3

“Retribution for the exile of Ptolemy came upon Cleopatra, for she was put to death by Alexander, whom she herself had made to be king of the Egyptians. When the deed was discovered, and Alexander fled in fear of the citizens, Ptolemy returned and for the second time assumed control of Egypt. He made war against the Thebans, who had revolted, reduced them two years after the revolt, and treated them so cruelly that they were left not even a memorial of their former prosperity, which had so grown that they surpassed in wealth the richest of the Greeks, the sanctuary of Delphi and the Orchomenians. Shortly after this Ptolemy met with his appointed fate, and the Athenians, who had been benefited by him in many ways which I need not stop to relate, set up a bronze likeness of him and of Berenice, his only legitimate child."

Cleopatra VII

Cleopatra VII

The person we know today as Cleopatra was officially named Cleopatra VII Thea Philopator Her birth name was Cleopatra netjeret mer-it-es “Goddess Beloved of Her Father”. In many respects she was The Last Pharaoh of Egypt, ruling Egypt from 51 to 30 B.C. when it was ruled by the Greek Ptolemies of which Cleopatra was a member. When Rome took over Egypt during the last days of her reign, her life and reign came to an end as did Ptolemic Egypt, which had been founded by Alexander's general, Ptolemy, in 326 BC.

According to Minnesota State University, Mankato: “Cleopatra the VII, also known as Cleopatra the VI, was queen of Egypt from 51 to 30 B.C. She was the daughter of Ptolemy XI. She was co-regent of Egypt from 51 to 49 B.C., but was dethroned by Ptolemy XII, from the year 49 to 48 B.C. She was reinstated to the throne following Julius Caesar's defeat of Ptolemy XII. She remained as co-regent with her brother Ptolemy XIII, from 47 to 44 B.C. Following this, she became mistress to Julius Caesar, living with him in Rome from 46 to 44 B.C. Eventually, she returned to Egypt and murdered Ptolemy XIII in 44 B.C. She then met Mark Anthony (a popular love story through out the ages), in 36 B.C. In 31 B.C. Octavian's army defeated Mark Anthony at the battle of Actium. Cleopatra and Mark Anthony fled, however, Cleopatra returned to Egypt and unsuccessfully attempted to seduce Octavian. According to legend she died of a bite by an asp to avoid being captured by Octavian. Cleopatra lived from 69 to 30 B.C."

Mark Millmore wrote in discoveringegypt.com: “Cleopatra was of Macedonian descent and not a native Egyptian. She was the second daughter of King Ptolemy XII. Historical accounts of Cleopatra tell of a beautiful, highly educated woman who was schooled in physics, alchemy, and astronomy, and could speak many languages. Her voice, said the Greek biographer Plutarch, “was like an instrument of many strings, which could pass from one language to another."

One historian wrote: “'For Rome, who had never condescended to fear any nation or people, did in her time fear two human beings; one was Hannibal, and the other was a woman.' In Roman literature during her lifetime and just after her death, Cleopatra represented the dangerous appeal of decadence and corruption. A highly educated Greek, with the wealth of Egypt at her disposal, she was mistress of first of Julius Caesar and then of Mark Antony."

Cleopatra VII (Philopator Nea Thea)
with Ptolemy XIII (Philopator): 52/1-47 B.C.
with Ptolemy XIV (Philopator): 47-44 B.C.
sole reign: 44-36 B.C.
coregency with Ptolemy XV (Caesar Philopator Philometor "Caesarion"): 36-30 involvement with Julius Caesar: 48 to 44 B.C.
involvement with Marc Antony: 41-30 B.C.
47 B.C., before January 15 death of Ptolemy XIII
44 B.C., between July and 2 September death of Ptolemy XIV
41 B.C. Caesarion temporarily on the throne
36 B.C. beginning of joint regency of Cleopatra & Caesarion

30 B.C., August 3 capture of Alexandria by Octavian

30 B.C., August 12 death of Cleopatra

30 B.C., August 31 beginning of Augustus’ reign

See Separate Articles on Cleopatra

Ptolemaic-Egyptian Temples

Edfu temple

Dendara (near Cairo) is the home of the Temple of Hathor, dedicated to the cow-headed goddess of healing. One of the best preserved temples in Egypt, it was built in the first century B.C. by the Ptolemaic Greeks and is famous for a ceiling painting, with astronomical symbols, and its great Hypostyle Hall. It even has a roof. The temple incorporates both Greek and Egyptian architectural styles. The 24 massive papyrus pillars in the main hall are capped with images of Hathor and decorated with hieroglyphics and Egyptian symbols. The stone ceiling features an Egyptian version of the star-lit sky, with goddess Nut, who, Egyptians believed, spanned the sky with her body and swallowed the sun each night and gave birth to it each morning. One of one of the walls is a famous picture of Cleopatra and Caesarian, her son from Julius Caesar.

Edfu (80 miles north of Aswan) is the home of the Temple of Horus, a huge and exquisite Ptolemaic Greek temple built to honor the falcon-headed son of Orisis. Regarded as the largest best-preserved ancient temples in Egypt, it took over 200 years to build and was finally finished by Cleopatra's father. Rediscovered in 1869, it features wonderful reliefs of Ptolemy XIII pulling the hair of his enemies like a pharaoh; depictions of the Feats of the Beautiful Meeting, the annual reunion between Horus and his wife Hathor; and a particularly fine ceiling relief of the goddess Nut in the New Year Chapel. There is also a

Nilometer, a Court of Offerings and a huge pylon (massive gate) at the entrance. In the 19th century , Flaubert wrote it “served as the public latrine for the entire town. Flaubert liked the town's dancers who did a kind of striptease called the bee."

Kom-Ombo (30 miles north of Aswan) is the home the unique Temple of Sobek and Horus, a Ptolemaic Greek temple dedicated to a local crocodile god (Sobek) and a local sky god (Horus). Located in a spectacular setting, a dune overlooking the Nile and surrounded by sugar cane fields, the temple was built in a mirror-like fashion---one side dedicated to Horus, the other to Sobek---so neither god would be offended. The are two courts, two colonnades, and two sanctuaries.

The Temple of Sobek and Horus is famous for its halls and entrances. Sculpted wall reliefs include one showing ancient surgical instruments, bone saws and dental tools. Worth checking out are the hieroglyphic-inscribed pillars. A number of crocodiles mummies have been found in the area of the Chapel of Harthor. There are some Old Kingdom tombs near Kom-Ombo village.

Roman Take Over Egypt

Roman rule was established in Egypt after Octavian (Augustus) displaced the last ruler of the Ptolemaic line, the famous Cleopatra VII. It proved to be a great and rich province for Augustus, who organized the country not so much as a Roman Province but as the emperor's own special domain land. In Egypt, the Emperor was considered the successor of the ancient nors.Pharaohs; his deputy - the prefect - ruled the country with an authority permitted to few other gover

The Romans took over Egypt in the second century B.C. Wheat and barley were exported to Rome and the rest of the empire. The worship of Egyptian gods and the building of Egyptian-style temples continued under the Romans.

According to the Metropolitan Museum of Art: “Rome's rule over Egypt officially began with the arrival of Octavian (later called Augustus) in 30 B.C., following his defeat of Marc Antony and Cleopatra in the battle at Actium. Augustus, who presented himself to the people of Egypt as the successor to the pharaohs, dismantled the Ptolemaic monarchy and annexed the country as his personal estate. He appointed a prefect (governor) for a limited term, which effectively depoliticized the country, neutralized rivalries for its control among powerful Romans, and undermined any possible focus for local sentiments. For almost a decade, Egypt was garrisoned with Roman legions and auxiliary units until conditions became stable. All business was transacted according to the principles and procedures of Roman law, and local administration was converted to a liturgic system in which ownership of property brought an obligation of public service. New structures of government formalized the privileges associated with "Greek" background.

“For the first century following the Roman conquest, Egypt functioned in the Mediterranean world as an active and prosperous Roman province. The value of Egypt to the Romans was considerable, as revenues from the country were almost equal to those from Gaul and more than twelve times those from Judaea. Its wealth was largely agricultural: Egyptian grain supplied the city of Rome. The country also produced papyrus, glass, and various finely crafted minor arts that were exported to the rest of the Roman empire. Its deserts yielded a variety of minerals, ores, and fine stones such as porphyry and granite, which were brought to Rome to be used for sculpture and architectural elements. Trade with central Africa, the Arabian Peninsula, and India flourished along the Nile, desert routes, and sea routes from the Red Sea port of Berenike. Goods and cultural influences flowed from Egypt to Rome through Alexandria, which Diodorus of Sicily described as "the first city of the civilized world" in the first century B.C. Its great library and community of writers, philosophers, and scientists were known throughout the ancient world.

“The conquest of Egypt and its incorporation into the Roman empire inaugurated a new fascination with its ancient culture. Obelisks and Egyptian-style architecture and sculpture were installed in Roman fora. The cult of Isis, the Egyptian mother goddess, had an immense impact throughout the empire. Likewise, changes were noticeable in Egyptian artistic and religious forms, as Egyptian gods were increasingly represented in classicizing style. Egyptian funerary arts evolved in a new and creative direction: traditional idealized images gave way to ones accessorized with contemporary Greco-Roman coiffures and dress as influenced by fashions of the imperial court at Rome, and even panel portraits were painted in the illusionistic Greco-Roman style. By the second century A.D., the economic and social changes in the country emerged more forcefully, gradually evolving as part of a larger pattern of change in the Roman empire that culminates in the Byzantine period."

The Lighthouse at Alexandria or Pharos of Alexandria is also considered one of those seven wonders. It is an ancient marvel not ever replicated in the modern world; an example of engineering design that has been lost to history.The Lighthouse, erected in the ancient Greek town of Alexandria, no longer exists. A spate of earthquakes between CE 956 and 1323 caused catastrophic failure. A remnant of a lighthouse, built to similar specifications by the Roman Empire, does however exist at Dover Castle in the United Kingdom.

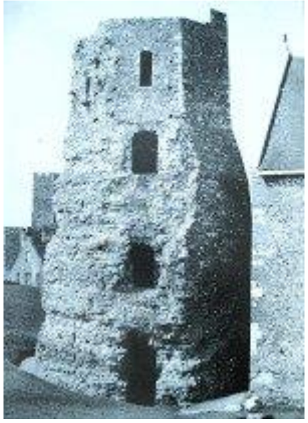


Image: Ruin of Roman Lighthouse at Dover Castle…Source: Garry Hogg

Pharos of Alexandria was engineered by Sostratus of Cnidus, the Greek architect and engineer in 280 BCE. It is said to have been the world's first lighthouse.It was also considered one of the highest buildings in the world, it stretched to 400 feet. But some believe it was originally 100 feet tall; the confusion allegedly stemming from the number of times the lighthouse was repaired after earthquake damage.

It had a square base made out of masonry blocks, lined with molten lead - this ensured a sturdy build that could withstand waves crashing into it.

Arab traveler Abou-Haggag Al-Andaloussi offers the most descriptive account of what the Pharos of Alexandria looked like. He wrote:

"The Pharos rises at the end of the island. The building square, about 8.5 meters (28ft) each side. The sea surrounds the Pharos except on the east and south sides. This platform measures, along its sides, from the tip, down to the foot of the Pharos walls, 6.5 metres (21ft) in height. However, on the sea side, it is larger because of the construction and is steeply inclined like the side of a mountain. As the height of the platform increases towards the walls of the Pharos its width narrows until it arrives at the measurements above."

Possible war machine

It is believed that a fire lit it at night, but mirrors reflecting the sunlight were used during the day. It is said that once the Romans had control over Alexandria, they utilized a rotating, reflective mirror system similar to that which is used today inside a modern lighthouse.Rumor amongst historians and legend suggest that the mirrors could have been used for warfare too with the Romans manipulating the mirrors to defend the city from enemies. This involved focusing the rays of the sun onto the mirrors then reflecting this magnified intensity onto the oncoming ships, leading to their fiery end. Scholars remain skeptical.Whether a war machine or not, it is still considered one of the greatest feats of engineering of its day. And for this glimpse into the ancient world of engineering our gratitude must go to the careful writings of a handful of Arab writers and 1st century Roman historian Josephus.

A **lighthouse** is a tower, building, or other type of structure designed to emit light from a system of lamps and lenses and to serve as a navigational aid for maritime pilots at sea or on inland waterways. From the time that man opened his wings in the sea he sought navigational Points to determine the ships‟ route. This need led to the lighting of fires on the dangerous capes and to the construction of Lighthouses. The first Lighthouses of the world appeared in the Mediterranean Sea, where the great civilizations were born. The evolution in the typology and construction of Lighthouses followed technological progress, whilst the difficulties that arose in the selection of both structure and materials resistant to the marine environment, led to the invention of pioneering materials and construction methods.

The simple form of the high tower was already instituted from its first appearance and became familiar following the Lighthouse of Alexandria (Fig. 1). Leon Battista Alberti (1404-1472) in his masterpiece „L‟ Archittetura‟, suggests constructional principles of the Towers-Lighthouses, which were followed until the 17th century, referring: *«… A Tower may have a square or circular ground plan. In either type a ratio between the height and the width is essential. If we wish a square tower to be slender, it will have a width at its base equal to 1/6 of the height, while the circular tower will have a diameter at its base equal to 1/4 of the height…The thickness of the masonry should at least be equal to 1/10 of the height…».*

The evolution of the contemporary Lighthouse form began around 1700 when Lighthouses were first constructed in the sea. Whilst stone and brick masonry continued to be the main building material of coastal Lighthouses, those in the open sea are, nowadays, made mainly from concrete and steel .Lighthouses mark dangerous coastlines, hazardous shoals, reefs, rocks and safe entries to harbors; they also assist in aerial navigation. Once widely used, the number of operational lighthouses has declined due to the expense of maintenance, and have become uneconomical since the advent of cheaper and often much more effective electronic navigational systems.

Before the development of clearly defined ports, mariners were guided by fires built on hilltops. Since elevating the fire would improve the visibility, placing the fire on a platform became a practice that led to the development of the lighthouse. In antiquity, the lighthouse functioned more as an entrance marker to ports than as a warning signal for reefs and promontories, unlike many modern lighthouses. The most famous lighthouse structure from antiquity was the Pharos of Alexandria, Egypt, which collapsed following a series of earthquakes between 956 and 1323.

The intact Tower of Hercules at A Coruña, Spain gives insight into ancient lighthouse construction; other evidence about lighthouses exists in depictions on coins and mosaics, of which many represent the lighthouse at Ostia. Coins from Alexandria, Ostia, and Laodicea in Syria also exist. The solid geometrical volume of the Lighthouse extends through the vertical axis, with no architectural exaggeration and simple morphological elements. The pure form, and the simplicity of the facade, is characterized by a structural functionality and precision. The basic principle is summed up by the phrase “functionality leads to the form

Typologyof Lighthouses

The Architecture of lighthouses is divided into 3 types ***of ground plan:***

1. Circular

2. Square

3.OctagonalorHexagonal

Lighthouse Anatomy Terms

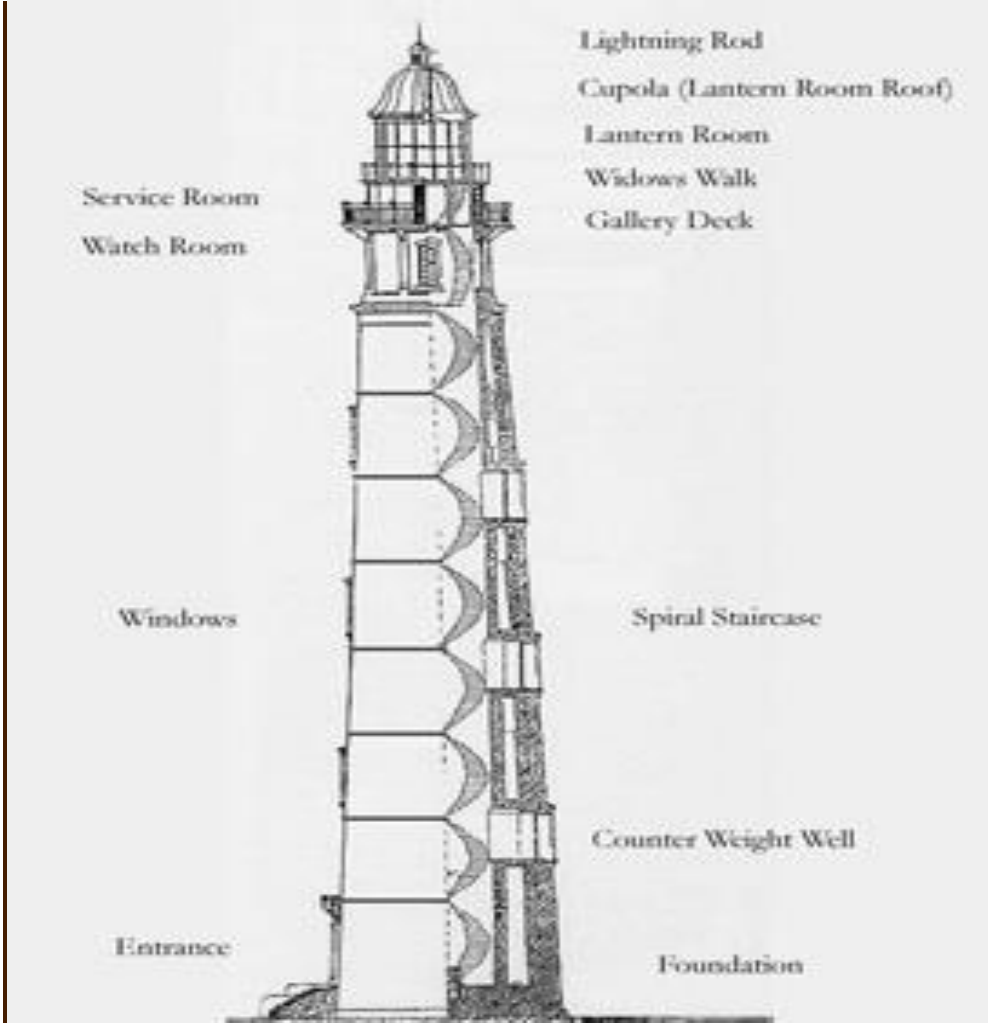
Lightning Rod: Lighthouses are struck by lightning a regular basis. Metal poles called lightning rods are attached to the tops of lighthouses to help minimize the damage created by lightning strikes. A lightning rod is attached to a thick copper wire that runs from the top of the lighthouses down to the ground. When lightning strikes the tower, it enters through the lightning rod, travels down the wire, and goes into the ground where it can cause less damage.

Cupola: The cupola is the roof of the lantern room. Because temperatures inside the lantern room can often soar well above 110 degrees, a metal ball at the top of the cupola provides ventilation and allows the heat to escape.

Lantern Room: The lantern room is the most important room in a lighthouse because that is where the lighthouse beacon (or light) is located. The walls of the lantern room are made of glass so the light can be seen at night.

Widow’s Walk: Named after the wives of sailors who watch for the return of their husband’s ship from the top of their house, the widow’s walk is a narrow platform that provides access to the outside of the lantern room.

12 Parts of a Lighthouse -



Gallery Deck: The gallery deck is a platform that circles the tower just below the lantern room. You can access the gallery deck from the service room through a heavy iron door. Lighthouse keepers would watch the weather and scan the horizon for approaching ships from the gallery deck.

Service Room: The service room is the room just below the lantern room where keepers would store cleaning equipment, spare parts for the beacon, and tools for working on the lighthouse.

Watch Room: The watch room is where keepers kept their log. A log is a kind of journal that keepers wrote brief descriptions of daily events, weather conditions, and notes in. Additional items used by keepers while on watch or while working at the top of the lighthouse were stored in this room as well.

Windows: Most lighthouses had windows to cool the tower and provide light.

Spiral Staircase: Most lighthouses have a long circular staircase leading from the bottom of the tower to the top. Landings are located about every 15 feet.

Counterweight Well: Before electricity, lighthouse beacons were turned using a system of gears powered by weights that hung down the center of the tower. The counterweight well would catch any weights that broke loose.

Entrance**:** Every lighthouse has a door leading into it.

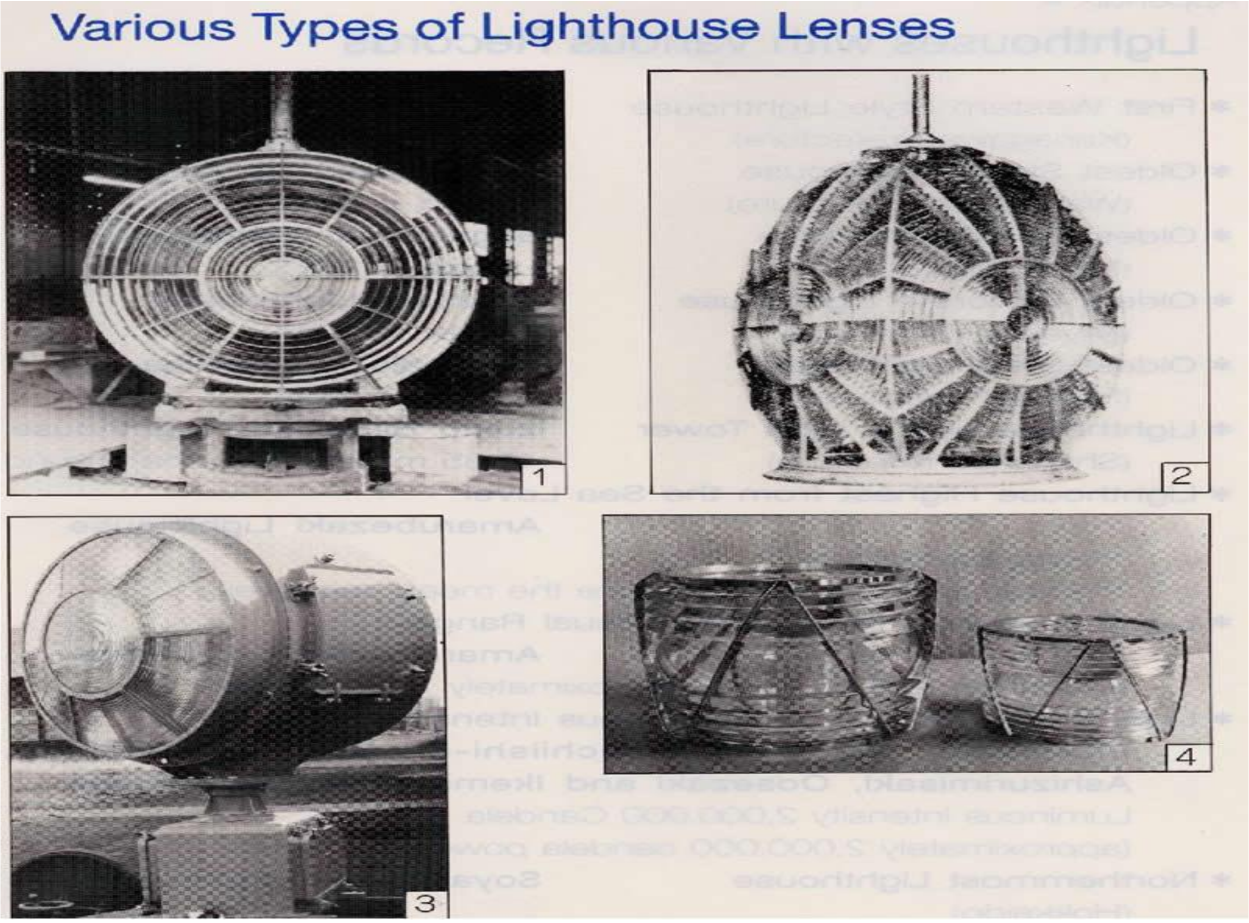
Foundation: A lighthouse’s foundation keeps it from falling over.

Lighting improvements

The source of illumination had generally been wood pyres or burning coal. The Argand lamp, invented in 1782 by the Swiss scientist, Aimé Argand, revolutionized lighthouse illumination with its steady smokeless flame. Early models used ground glass which was sometimes tinted around the wick. Later models used a mantle of thorium dioxide suspended over the flame, creating a bright, steady light. The Argand lamp used whale oil, colza, olive oil or other vegetable oil as fuel which was supplied by a gravity feed from a reservoir mounted above the burner. The lamp was first produced by Matthew Boulton, in partnership with Argand, in 1784 and became the standard for lighthouses for over a century.

South Foreland Lighthouse was the first tower to successfully use an electric light in 1875. The lighthouse's carbon arc lamps were powered by a steam-driven magneto. John Richardson Wigham was the first to develop a system for gas illumination of lighthouses. His improved gas 'crocus' burner at the Baily Lighthouse near Dublin was 13 times more powerful than the most brilliant light then known.[13]

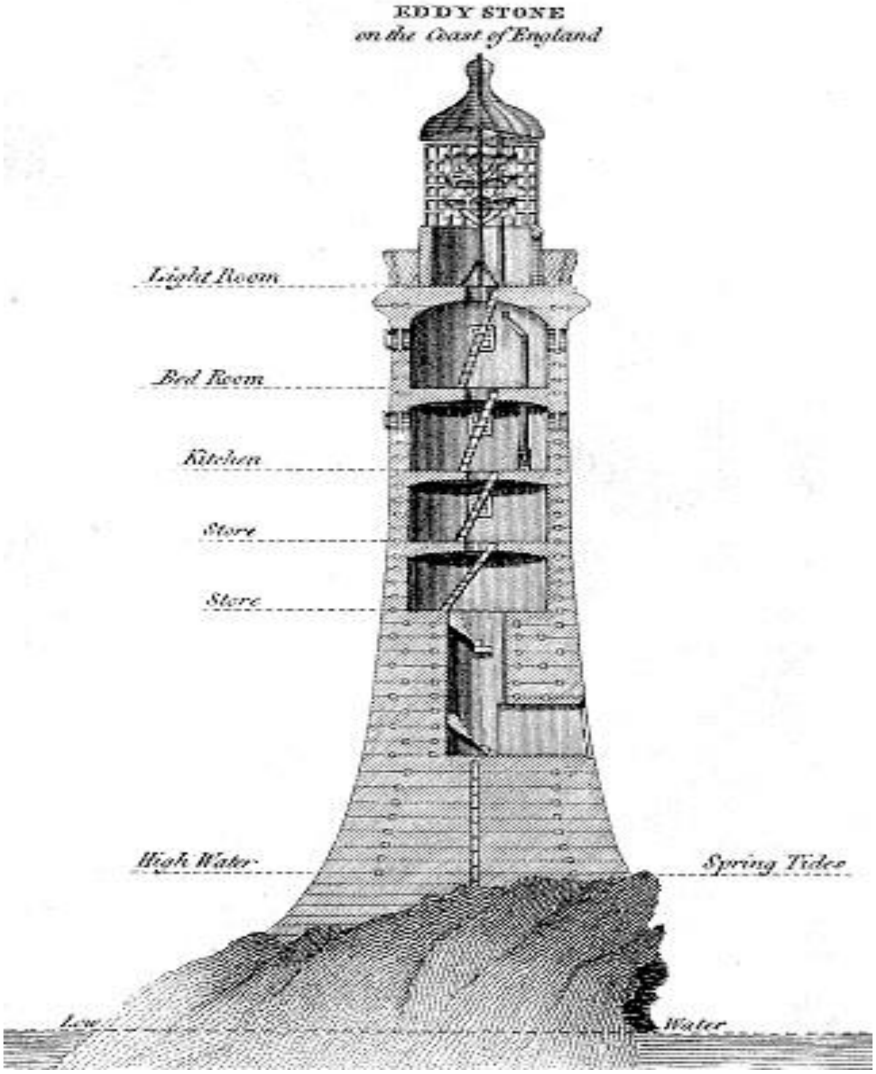
An 85 millimetres (3.3 in) Chance Brothers *Incandescent Petroleum Vapour Installation* which produced the light for the Sumburgh Head lighthouse until 1976. The lamp (made in approx. 1914) burned vaporized kerosene (paraffin); the vaporizer was heated by a denatured alcohol (methylated spirit) burner to light. When lit some of the vaporised fuel was diverted to a Bunsen burner to keep the vaporizer warm and the fuel in vapor form. The fuel was forced up to the lamp by air; the keepers had to pump the air container up every hour or so. This in turn pressurized the paraffin container to force the fuel to the lamp. The "white sock" is in fact an unburnt mantle on which the vapor burned.The vaporized oil burner was invented in 1901 by Arthur Kitson, and improved by David Hood.


Various Types of Lighthouse Lenses

History Of Lighthouses of antiquity

The forerunners of lighthouses proper were beacon fires kindled on hilltops, the earliest references to which are contained in the *Iliad* and the *Odyssey* (*c.* 8th century BCE). The first authenticated lighthouse was the renowned Pharos of Alexandria, which stood some 350 feet (about 110 metres) high.

The Romans erected many lighthouse towers in the course of expanding their empire, and by 400 CE there were some 30 in service from the Black Sea to the Atlantic. These included a famous lighthouse at Ostia, the port of Rome, completed in 50 CE, and lighthouses at Boulogne, France, and Dover, England. A fragment of the original Roman lighthouse at Dover still survives.



The Phoenicians, trading from the Mediterranean to Great Britain, marked their route with lighthouses. These early lighthouses had wood fires or torches burning in the open, sometimes protected by a roof. After the 1st century CE, candles or oil lamps were used in lanterns with panes of glass or horn.

Medieval lighthouses

The decline of commerce in the Dark Ages halted lighthouse construction until the revival of trade in Europe about 1100 CE. The lead in establishing new lighthouses was taken by Italy and France. By 1500, references to lighthouses became a regular feature of books of travel and charts. By 1600, at least 30 major beacons existed.

These early lights were similar to those of antiquity, burning mainly wood, coal, or torches in the open, although oil lamps and candles were also used. A famous lighthouse of this period was the Lanterna of

Genoa in Italy, probably established about 1139. It was rebuilt completely in 1544 as the impressive tower that remains a conspicuous seamark today. The keeper of the light in 1449 was Antonio Columbo, uncle of the Columbus who crossed the Atlantic. Another early lighthouse was built at Meloria, Italy, in 1157, which was replaced in 1304 by a lighthouse on an isolated rock at Livorno. In France the Roman tower at Boulogne was repaired by the emperor Charlemagne in 800. It lasted until 1644, when it collapsed owing to undermining of the cliff. The most famous French lighthouse of this period was one on the small island of Cordouan in the estuary of the Gironde River near Bordeaux. The original was built by Edward the Black Prince in the 14th century. In 1584 Louis de Foix, an engineer and architect, undertook the construction of a new light, which was one of the most ambitious and magnificent achievements of its day. It was 135 feet in diameter at the base and 100 feet high, with an elaborate interior of vaulted rooms, richly decorated throughout with a profusion of gilt, carved statuary, and arched doorways. It took 27 years to build, owing to subsidence of the apparently substantial island. By the time the tower was completed in 1611, the island was completely submerged at high water. Cordouan thus became the first lighthouse to be built in the open sea, the true forerunner of such rock structures as the Eddystone Lighthouse.

The influence of the Hanseatic League helped increase the number of lighthouses along the Scandinavian and German coasts. At least 15 lights were established by 1600, making it one of the best-lighted areas of that time.

During this period, lights exhibited from chapels and churches on the coast frequently substituted for lighthouses proper, particularly in Great Britain.

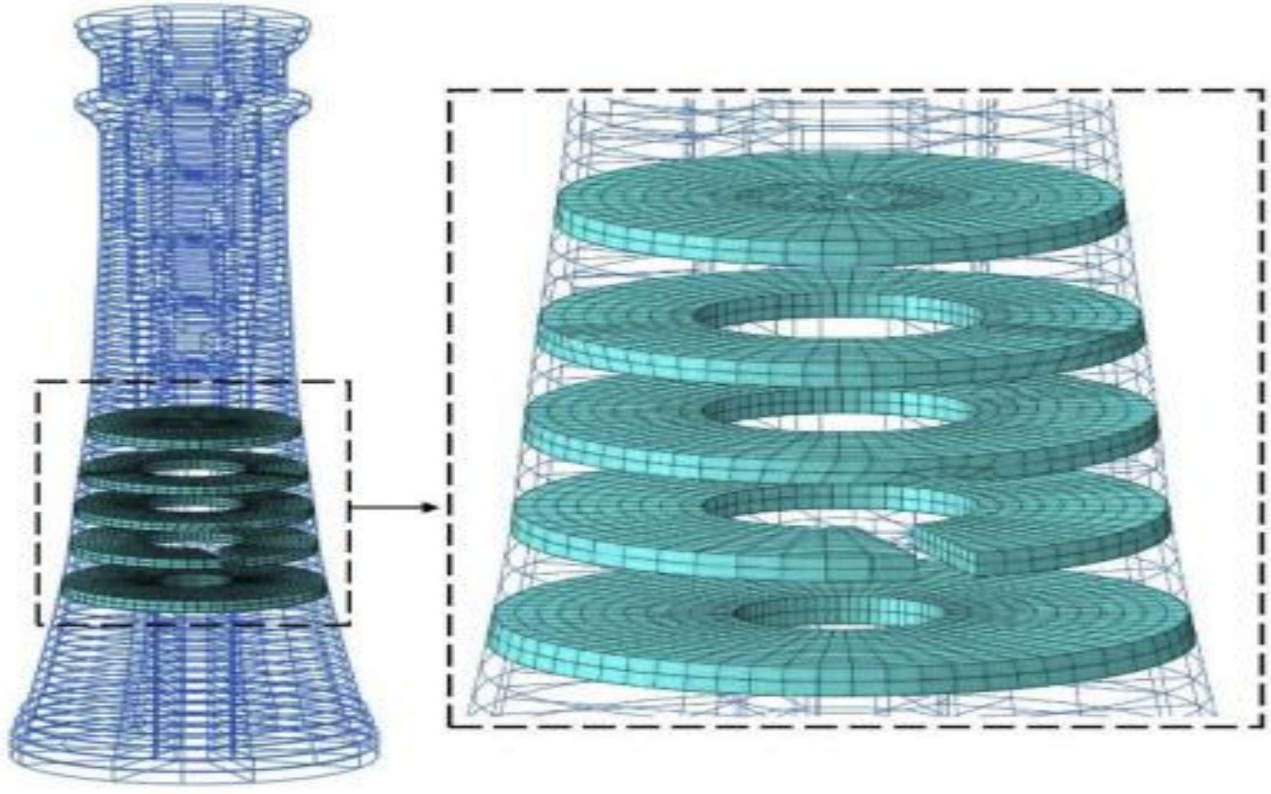
The beginning of the modern era

The development of modern lighthouses can be said to have started about 1700, when improvements in structures and lighting equipment began to appear more rapidly. In particular, that century saw the first construction of towers fully exposed to the open sea. The first of these was Henry Winstanley’s 120-foot-high wooden tower on the notorious Eddystone Rocks off Plymouth, England. Although anchored by 12 iron stanchions laboriously grouted into exceptionally hard red rock, it lasted only from 1699 to 1703, when it was swept away without a trace in a storm of exceptional severity; its designer and builder, in the lighthouse at the time, perished with it. It was followed in 1708 by a second wooden tower, constructed by John Rudyerd, which was destroyed by fire in 1755. Rudyerd’s lighthouse was followed by John Smeaton’s famous masonry tower in 1759. Smeaton, a professional engineer, embodied an important new principle in its construction whereby masonry blocks were dovetailed together in an interlocking pattern. Despite the dovetailing feature, the tower largely relied on its own weight for stability—a principle that required it to be larger at the base and tapered toward the top. Instead of a straight conical taper, though, Smeaton gave the structure a curved profile. Not only was the curve visually attractive, but it also served to dissipate some of the energy of wave impact by directing the waves to sweep up the walls.

Owing to the undermining of the foundation rock, Smeaton's tower had to be replaced in 1882 by the present lighthouse, constructed on an adjacent part of the rocks by Sir James N. Douglass, engineer-in-chief of Trinity House. In order to reduce the tendency of waves to break over the lantern during severe storms (a problem often encountered with Smeaton's tower), Douglass had the new tower built on a massive cylindrical base that absorbed some of the energy of incoming seas. The upper portion of Smeaton's lighthouse was dismantled and rebuilt on Plymouth Hoe, where it still stands as a monument; the lower portion or "stump" can still be seen on the Eddystone Rocks.

The methods used by the architects and engineers in the ancient world often remain mysterious and enigmatic. How the Great Pyramids of Giza were built, for example, still manage to stump engineers and other experts from around the world.

Neither the tools nor the techniques used to construct these complex and giant edifices can be fully explained. It is this fact that makes them one of the seven wonders of the ancient world.



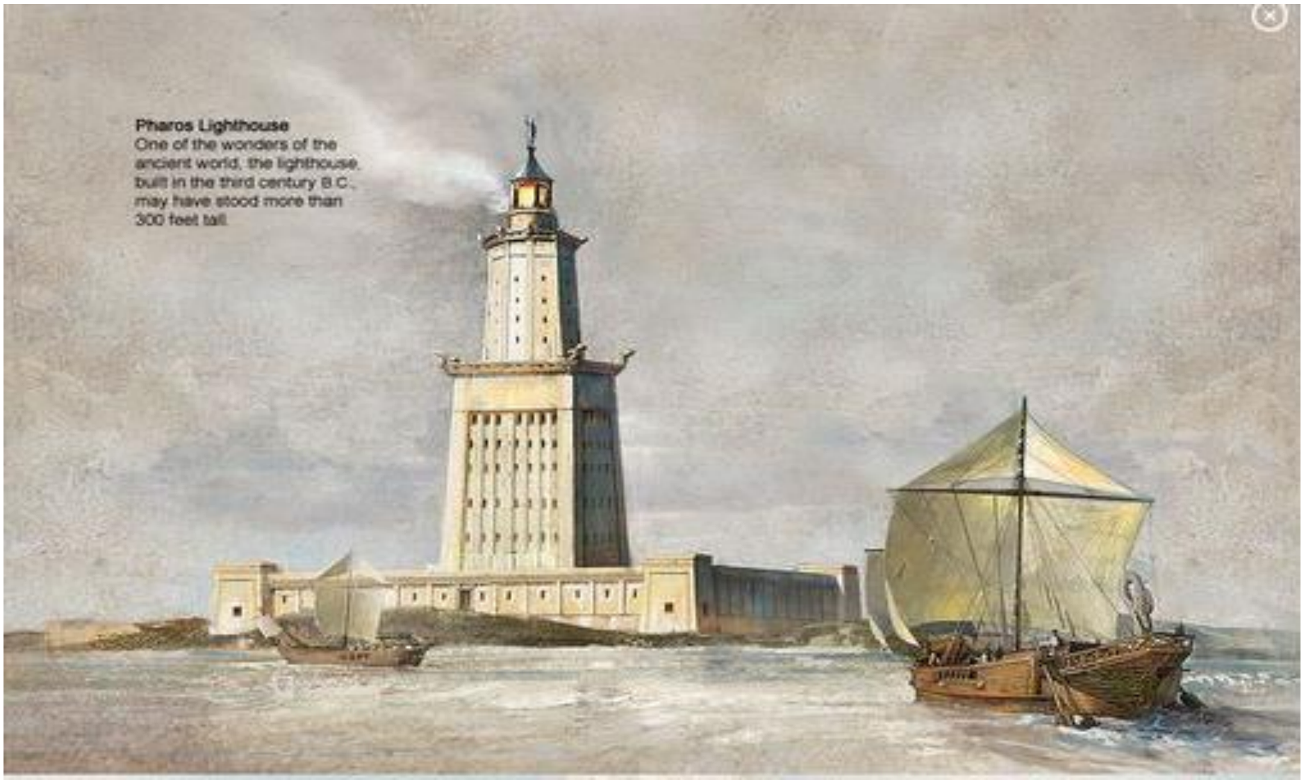
Area of Impact of waves in a Typical Sea Lighthouse

REFERENCES

1. Portraits of the Ptolemies: Greek Kings as Egyptian Pharaohs,**By Paul Edmund Stanwick**
2. The Architecture of Alexandria and Egypt, C. 300 B.C. to A.D. 700, Volume 63, Yale University Press
3. Portraits of the Ptolemies: Greek Kings as Egyptian Pharaohs, **Paul Edmund Stanwick, University of Texas Press**

CHAPTER II

The Architecture of Alexandria Lighthouse


Pharos Lighthouse
One of the wonders of the ancient world, the lighthouse, built in the third century B.C., may have stood more than 300 feet tall.

Honor Frost (28 October 1917 – 12 September 2010) was a pioneer in the field of underwater archaeology, who led many Mediterranean archaeological investigations, especially in Lebanon, and was noted for her typology of stone anchors and skills in archaeological illustration.In 1968 she led a UNESCO expedition to survey the Pharos site in the Port of Alexandria, for which she was later awarded, in 1997, a French government medal for pioneering submarine archaeology in Egypt.[1]

Alexandria, Egypt, before Alexander the Great: A multidisciplinary approach yields rich discoveries. The Port of Alexandria is on the West Verge of the Nile Delta between the Mediterranean Sea and Mariut Lake in Alexandria, Egypt, and is considered the second most important city and the main port in Egypt. Alexandria port consists of two harbours (East and West) separated by a T-shaped peninsula. The East harbour is shallow and is not navigable by large vessels. The West harbour is used for commercial shipping. The harbour is formed by two converging breakwaters.

Ancient times

Ptolemy was the creator of the longest lasting of the Hellenistic kingdoms. He created a state whose cultural importance was unparalleled until the coming of Rome. He encouraged the erection of the Pharos Lighthouse, one of the seven wonders of the ancient world, as well as creating a library which eventually contained the greatest collection of books until relatively recent times. Ptolemy's institution of higher learning, the Museum, gave birth to the greatest advancements in science before the seventeenth century of our own achievements in and beyond Egypt in the context of the fragmentation of Alexander's enormous empire and the creation of the Hellenistic state. [2]

The Ptolemaic Legacy

The Mouseion / Library

When Ptolemy Soter assumed power, he asked Demitrius Phalerus, a follower of Aristotle, to found a library system at Alexandria that would rival that of Athens. The Alexandrian Mouseion, however, ar superseded its Greek prototype to become an intellectual and scientific institution; a university system rather than a bibliotheca. It was here, in the third century BC, that Archimedes invented the pump still in use today and known as *Archimedes' screw*, and, in the second century BC, that Hypsicles first divided the circle of the zodiac into 360 degrees. Ancient historians claim that the library's 500,000 book collection was so comprehensive that no manuscript was available in any library worldwide that was not available in Alexandria.

Mathematics

Have you ever heard of Euclidean Geometry? Did you know that Euclid lived, developed his theories, and wrote *Elements* at the Alexandria Mouseion during the reign of Ptolemy II Philadelphus? In his *Elements*, Euclid provided a comprehensive analysis of geometry, proportions, and theory of numbers. His other notable contribution, *Optics*, is a treatise of geometrical optics. In the Mouseion, the first studies of conic sections (Ellipse, Parabola, and Hyperbola) were carried out by Conon of Samos and Appolonius of Perga. Later, Pappus wrote his *Collection*, Menelaus studied spherical triangles, and Sporus, Heron, Diophantus, Theon, and his daughter Hypatia, taught mathematics.

Geography and Astronomy

Have you ever heard of the Alexandrian astronomer Eratosthenes? Do you know that he measured the Earth diameter more than 15 centuries before Copernicus and Galileo were even born? Eratosthenes was born in Cyrene in 276 BC, and, upon the death of Callimachus, was offered the post of "Chief Librarian of the Mouseion", a most highly respected position. His measurement of the Earth diameter was the most exciting of his achievements, although not the only one. He believed the Earth is round, and knew that shadows cast by the sun in Alexandria and Aswan (Syene) were unequal. He took measurements inside a deep well in Syene and along an obelisk in Alexandria a year apart, on the same day of the year. Knowing the distance between both cities, and using simple calculations, he estimated the Earth diameter at 7,850 miles. Today, we know that Eratosthenes' estimate was only about 0.5% off.

The great Alexandrian geographer and astronomer Claudius Ptolemy was born in AD 100. The work he developed was a product of the knowledge compiled in the Mouseion during the Ptolemaic period. He wrote many books including *Geography*, *Almagest*, *Handy Tables*, and *Planisphaerium*. He proposed the "Ptolemaic" Theory which states that Universe revolves around the Earth. The theory was adopted by scientists until the sixteenth century.

Aristarchus of Samos, Eratosthenes' co-worker in Alexandria, had suggested in the third century BC the heliocentric hypothesis, which states that the Earth and the planets revolve around the Sun. Ironically, fifteen centuries later, people were still arguing whether or not the earth is flat. Unfortunately, very little is known of Aristarchus' work and writings which perished along with the Library.

The Monuments

The Lighthouse

The construction of the Lighthouse of Alexandria was completed during the reign of Ptolemy II Philadelphus. It ranked as one of the Seven Wonders of the Ancient World. In fact, it was the only Wonder that had a practical secular use. This blend of beauty and scientific practicality was exclusive to the Ptolemies and their culture. Its architect, Sostratus, was a contemporary of Euclid. The full design of the Pharos and its accessories was carried out at the Mouseion. It stood approximately 150 meters high (a 50-storey modern building). Most impressive, was the mysterious "mirror" that was installed at the building summit. It was capable of detecting ships in the sea that were invisible to the naked eye and was used to magnify the intensity of the light emitting from the "lantern" at the top. A statue of Poseidon decorated the summit of the building.

The Palace

The Ptolemaic Palace system covered the promontory of Silsila, and stretched south and west. Recent archeological evidence suggests that the buildings reached as far west as today's Raml Station,that is, about a mile along the shores of the Eastern Harbour. The palace system was connected to the Mouseion, and the Caesarium which was built later by Cleopatra in honor of Julius Caesar. An Island Palace, called Antirrhodus, was erected off of Alexandria's mainland in the Eastern Harbour. In later periods, water levels rose, and the Island subsided; remains of the Island Palace are submerged underneath the water of the Harbour.

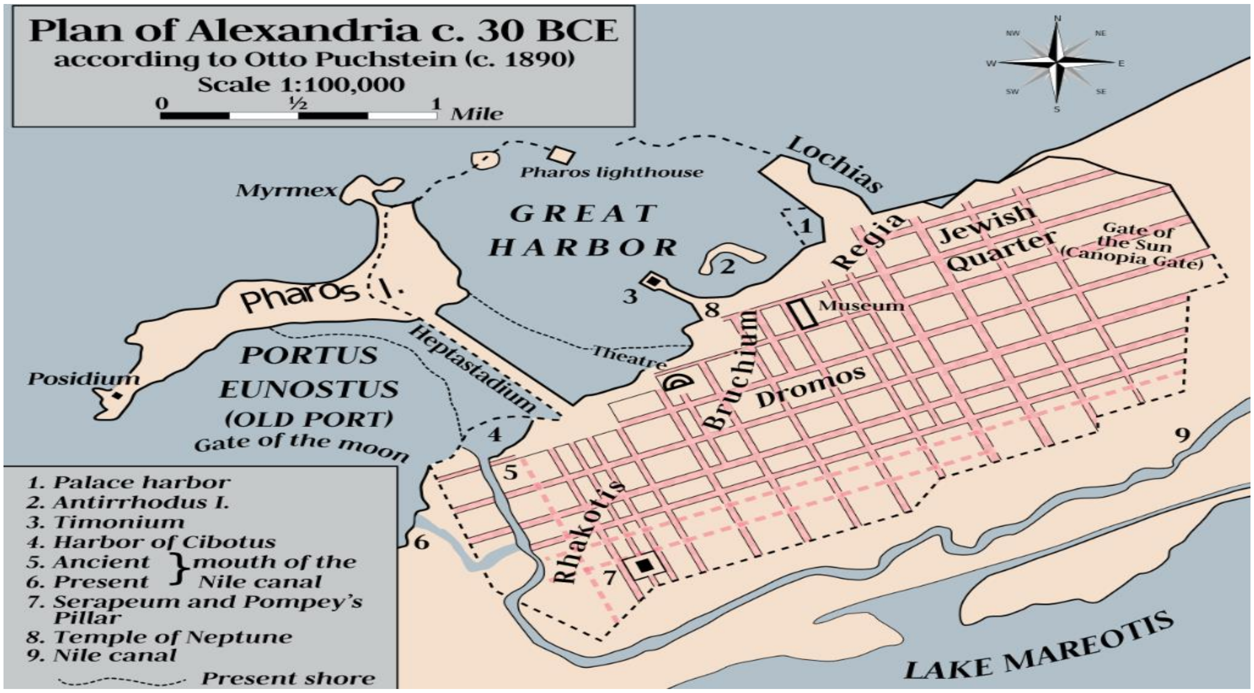
The Temple of Serapis

Built in honor of the Egyptian God, Osiris, the temple was home to worshippers of all sects. Osiris, Zeus, Pluto, Apis, and others all lived in harmony there. It was the last stronghold of Paganism against Christianity. Built along the lines of Greek architecture, the temple is located in Kom-El-Dikka, site of the ancient town of Rhakotis.

The Heptastadion Dyke

Connecting the Island of Pharos with Egypt's mainland was part of Alexander's plan. A dyke, the Heptastadion (seven stades long) was completed during the Ptolemaic period, and provided not only easy access to Pharos, but a double harbor to the city. Later on, the area around the Heptastadion silted and formed the isthmus known today as Mansheya.

Alexandria Port is one of the oldest ports in the world. The earliest port facilities were built in 1900 BC in the then-village of Rhakotis, to service coastal shipping and supply the island of Pharos (now part of the "Ras al-Tin" quarter).



Over the centuries sand and silt deposits made the port unnavigable. It was cleared by forces under the command of Alexander the Great in 331 BC as part of the construction of Alexandria city to be the marine base for his fleet. Alexander's engineer Dinocrat linked the port of Alexandria and the island of Pharos with a bridge 1200 meters long and 200 meters wide, creating two harbour basins for commercial and military shipping. The northeast basin (*Portus Magnus*, currently the Eastern harbour) was designed for military vessels and the southwest basin (*Portus Eunostus*, currently the main port of Alexandria) was for commercial use. In the Ptolemy era a second bridge was built to Pharos, further dividing the eastern harbour into two separate inlets.

According to Strabo, Alexandria had an inland harbour on Lake Mareotis as well as the harbours on the Mediterranean. The lake had no mouth connecting it to the sea but was instead connected to the Nile by canals. Strabo describes the lake harbour as being busier than the harbours on the sea.[2] During the period of Roman Egypt, grain was exported in large quantities from the city's Western Harbour, earning it the name "Portus Magnus". The grain was brought down the Nile by barge and stored in large granaries near the shore of Lake Mareotis before shipping. At the height of the Roman Empire, Alexandria was shipping 83,000 tons of grain per year to Rome. By the time of the late Empire, the city was shipping 220,000 tons of grain per year to Constantinople.[3]

Egypt

When Alexander destroyed Tyre, most of the towns on the route to Egypt quickly capitulated. However, Alexander met with resistance at Gaza. The stronghold was heavily fortified and built on a hill, requiring a siege. When "his engineers pointed out to him that because of the height of the mound it would be impossible... this encouraged Alexander all the more to make the attempt".After three unsuccessful assaults, the stronghold fell, but not before Alexander had received a serious shoulder wound. As in Tyre, men of military age were put to the sword and the women and children were sold into slavery.

Alexander advanced on Egypt in later 332 BC, where he was regarded as a liberator. He was pronounced son of the deity Amun at the Oracle of Siwa Oasis in the Libyan desert. Henceforth, Alexander often referred to Zeus-Ammon as his true father, and after his death, currency depicted him adorned with the Horns of Ammon as a symbol of his divinity.[82] During his stay in Egypt, he founded Alexandria-by-Egypt, which would become the prosperous capital of the Ptolemaic Kingdom after his death.

Founding of cities

Over the course of his conquests, Alexander founded some twenty cities that bore his name, most of them east of the Tigris.

Alexander the Great founded, or substantially re-established, or renamed, several towns or cities.

They are (with present-day locations):

- Alexandropolis Maedica, in Thrace, modern Bulgaria.
- Alexandria in Troas, modern Dalyan in Turkey.
- Alexandria by the Latmus, possibly Alinda, Turkey.
- Alexandria near Issus; İskenderun in Turkey preserves the name, but probably not the exact site.
- Alexandria, Egypt.
- Alexandria Ariana, now Herat, Afghanistan.
- Alexandria Prophthasia, perhaps Farah, Afghanistan.
- Alexandria Arachosia, now Kandahar, Afghanistan.
- Alexandria in the Caucasus, now Bagram, Afghanistan.
- Alexandria Eschate, at or close to modern Khujand, Tajikistan.
- Alexandria on the Oxus, probably Ai-Khanoum, Afghanistan.

- Six cities north of the Oxus, one of which may be Termez, Uzbekistan.
- Alexandria in Margiana, formerly Merv, Turkmenistan.
- Arigaeum, modern Nawagai, Bajaur, Pakistan.
- Nicaea and Alexandria Bucephalous (Bucephala), somewhere in modern Punjab, Pakistan.
- Alexandria on the Hyphasis; In Punjab, India on the western bank of the Beas (Hyphasis) river.
- Alexandria on the Indus, possibly Uch, Pakistan, and another town on the Indus.
- Patala and Xylinepolis, unknown, possibly near Hyderabad, Sindh, Pakistan.
- Alexandria in Orietai near Rhambacia, possibly Bela, Pakistan.
- Alexandria Carmania, unknown location in Iran.
- Alexandria in Susiana, later Charax Spasinu, Persian Gulf.
- Alexandria in Opiania, Ghazni, Afghanistan.
- Nikephorion, present day Raqqa in Syria. Isidore of Charax, in the Parthian Stations, wrote that it was a Greek city founded by Alexander the Great.

The first, and greatest, was Alexandria in Egypt, which would become one of the leading Mediterranean cities. The cities' locations reflected trade routes as well as defensive positions. At first, the cities must have been inhospitable, little more than defensive garrisons. Following Alexander's death, many Greeks who had settled there tried to return to Greece. However, a century or so after Alexander's death, many of the Alexandrias were thriving, with elaborate public buildings and substantial populations that included both Greek and local peoples.

Funding of temples

Dedication of Alexander the Great to Athena Polias at Priene, now housed in the British Museum

In 334 BC, Alexander the Great donated funds for the completion of the new temple of Athena Polias in Priene, in modern-day western Turkey. An inscription from the temple, now housed in the British Museum, declares: "King Alexander dedicated [this temple] to Athena Polias." This inscription is one of the few independent archaeological discoveries confirming an episode from Alexander's life. The temple was designed by Pytheos, one of the architects of the Mausoleum at Halicarnassus.

Hellenization

Alexander's empire was the largest state of its time, covering approximately 5.2 million square km.

Hellenization was coined by the German historian Johann Gustav Droysen to denote the spread of Greek language, culture, and population into the former Persian empire after Alexander's conquest. That this export took place is undoubted, and can be seen in the great Hellenistic cities of, for instance, Alexandria, Antioch and Seleucia (south of modern Baghdad). Alexander sought to insert Greek elements into Persian culture and attempted to hybridize Greek and Persian culture. This culminated in his aspiration to homogenize the populations of Asia and Europe. However, his successors explicitly rejected such policies. Nevertheless, Hellenization occurred throughout the region, accompanied by a distinct and opposite 'Orientalization' of the successor states.[

The core of the Hellenistic culture promulgated by the conquests was essentially Athenian. The close association of men from across Greece in Alexander's army directly led to the emergence of the largely Attic-based "koine", or "common" Greek dialect. Koine spread throughout the Hellenistic world, becoming the lingua franca of Hellenistic lands and eventually the ancestor of modern Greek.[245] Furthermore, town planning, education, local government, and art current in the Hellenistic period were all based on Classical Greek ideals, evolving into distinct new forms commonly grouped as Hellenistic. Aspects of Hellenistic culture were still evident in the traditions of the Byzantine Empire in the mid-15th century.

Legendary accounts surround the life of Alexander the Great, many deriving from his own lifetime, probably encouraged by Alexander himself. His court historian Callisthenes portrayed the sea in Cilicia as drawing back from him in proskynesis. Writing shortly after Alexander's death, another participant, Onesicritus, invented a tryst between Alexander and Thalestris, queen of the mythical Amazons. When Onesicritus read this passage to his patron, Alexander's general and later King Lysimachus reportedly quipped, "I wonder where I was at the time.’’

In the first centuries after Alexander's death, probably in Alexandria, a quantity of the legendary material coalesced into a text known as the *Alexander Romance*, later falsely ascribed to Callisthenes and therefore known as *Pseudo-Callisthenes*. This text underwent numerous expansions and revisions throughout Antiquity and the Middle Ages, containing many dubious stories, and was translated into numerous languages

Before the construction of the lighthouse-The context

Already in the 3rd century BC the city was a center of knowledge, in the sense that the world of the time was limited to the Mediterranean and the surrounding kingdoms. The most popular areas were literature, science, mathematics, astronomy and medicine. Many scholars make discoveries that we always remember or that are still used. On the architectural side, it is essentially the monuments that are remarkable. The city is covered with edifice whose purpose is to mark the power of the kingdom. These monuments are built over time, at different times.

By the end of the third century BC the population had increased considerably. The port before a strong activity, it is around him that will build the famous lighthouse.

The reasons for the construction of the Alexandria lighthouse

There are two reasons for the construction of the Alexandria lighthouse. First of all a utilitarian reason. The city had, at a short distance, an island called "Pharos". Gradually brought closer to the land by the deposit of silt brought by the Nile, it became a peninsula, forming two curves tightening towards the earth, delimiting two natural harbors that were quickly used.

Still, the Egyptian coast is dangerous. Flanked by reefs flush with the surface and even under water, it has sent a large number of Greek and Roman ships to the bottom, causing human dramas and material losses. To secure the port it was necessary to build a lighthouse, which was done.

The other reason is symbolic. A lighthouse was a rare building in the world, it was difficult to build because the proximity to the sea made complex work and the maintenance of the building was much more difficult to achieve than for buildings on land. Moreover, such works were always more useful for other buildings than for a lighthouse, which had always been used by sailors. It was therefore not only useful to build a lighthouse at the entrance to the port. It also marked the power of Egypt, and more particularly of Alexandria. The lighthouse was therefore a symbol of power, it served to propagate the name of Alexandria in the World.

Note that its reputation was so great that the name of this island became a common name: The island of Pharos, originally the word "Pharus" in Latin, which became "Phare" in French. All the Latin languages have the same word to designate this edifice.

8 Copies of the Lighthouse of Alexandria: A lighthous**e** is a tower, building, or other type of structure designed to emit light from a system of lamps and lenses and to serve as a navigational aid for maritime pilots at sea or on inland waterways.Lighthouses mark dangerous coastlines, hazardous shoals, reefs, rocks and safe entries to harbors; they also assist in aerial navigation. Once widely used, the number of operational lighthouses has declined due to the expense of maintenance, and have become uneconomical since the advent of cheaper and often much more effective electronic navigational systems.

Before more permanent structures were built, hilltop fires were used for sea navigation. People eventually started building platforms to increase the fires' visibility, which eventually led to the development of lighthouses. Unlike modern lighthouses, which are used as warnings, ancient towers were used as entrance markers to ports. According to Homeric legend, the first lighthouse was invented by Palamidis of Nafplio. Only one of these ancient lighthouses is well-documented and included on this list. With the exception of one lighthouse, all of these lighthouses are still running today.

8. Boston Light

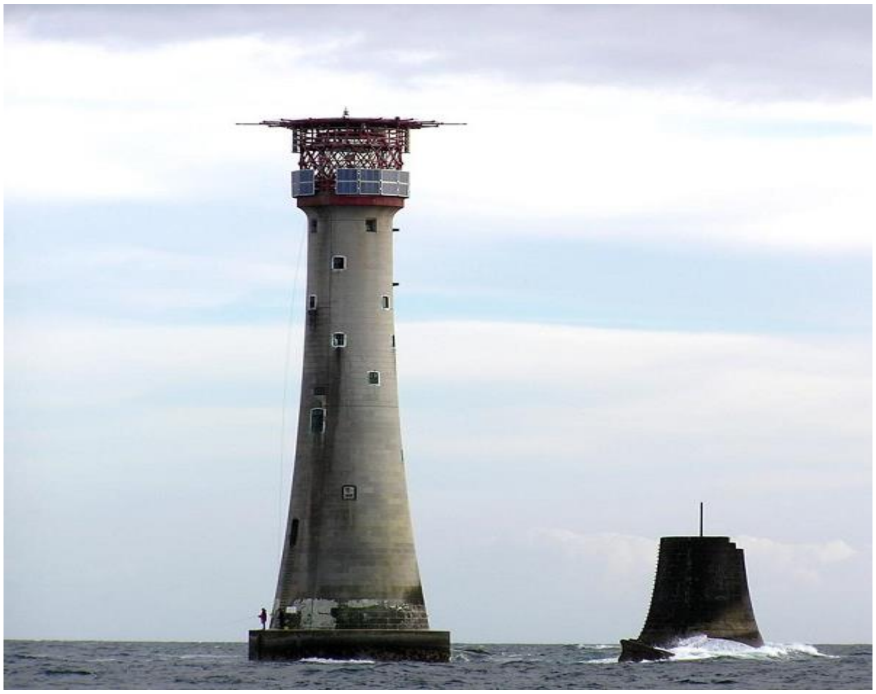
Year Created: original 1716; current in 1783, **Location:** Little Brewster Island, Boston, Massachusetts **Height:** 27 m (89 ft) **Still Standing:** Yes

Boston Light, the lighthouse located on Little Brewster Island, was the first lighthouse built in the United States. The first lighthouse on the site was lit on September 4, 1716. To help maintain the lighthouse, a tonnage tax of 1 penny per ton on all vessels, except coasters, moving in or out of Boston Harbor was collected. Before the start of the American Revolution, the British took control of the island in 1774 and blocked the harbor the following year. During the Revolution, American troops destroyed the lighthouse, preventing the British from using it and disabling their ships.

In 1783, the Massachusetts Legislature supplied money to build a new lighthouse, which still stands today. It is the only lighthouse in America still actively staffed by the U.S. Coast Guard, even though it was automated in 1998. Boston Light was designated a National Historic Landmark in 1964.

7. Eddystone Lighthouse (Winstanley's Lighthouse; Rudyard's Lighthouse; and Smeaton's Tower)

Year Created: first in 1698; second in 1709; third in 1759; and current in 1882, **Location:** Rame Head, Devon, England, **Height:** currently 49 m (161 ft); 18 m (59 ft) (first); 21 m (69 ft) second; and 22 m (72 ft) (third), **Still Standing:** Yes



The Eddystone Lighthouse is well-known for its extensive history; it is the fourth lighthouse built on the dangerous Eddystone Rocks. Before the first lighthouse was built, several shipwrecks occurred in the area as it was one of the most important naval routes. The first lighthouse on the site was known as Winstanley's Lighthouse and it was lit on 1698. It was the world's first open ocean lighthouse. This tower only lasted for a few years until it was destroyed by the Great Storm of 1703.

John Rudyard was commissioned to build the second lighthouse, which was completed in 1709 and destroyed by a fire in 1755. Smeaton's Tower (designed by John Smeaton), the third lighthouse and most important iteration, was constructed in 1759. It influenced modern lighthouse design and the development of concrete for building. The current tower was lit in 1882 and stands next to the remains of Smeaton's Tower.

6. Cordouan Lighthouse

Year Created: 1611, **Location:** Gironde, France, **Height:** 68 m (223 ft), **Still Standing:** Yes

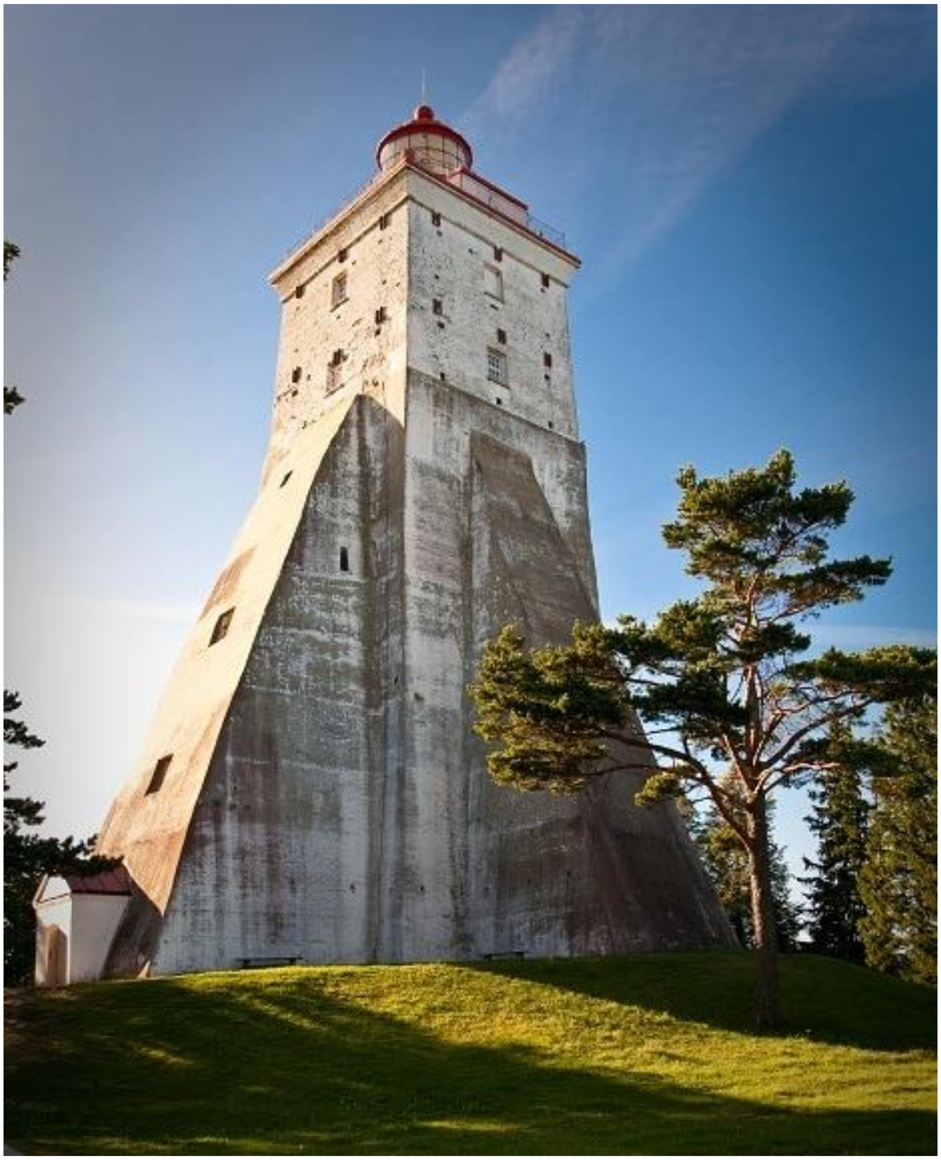
The Cordouan Lighthouse (Tour de Cordouan) is the oldest lighthouse in France and the tenth tallest traditional (built of masonry) lighthouse in the world. Before the current tower was built between 1584 – 1611, small beacon towers existed on the islet since at least 880 CE.

The first proper structure was about 15 m (48 ft) high and was implemented by Edward, the Black Prince as the area was an English province at the time. Passing ships paid two groats (old English silver coins) to pass, marking the first known instacne of lighthouse fees. By the mid-16th century, this first lighthouse fell into disrepair, which threatened the navigation of the Bordeaux wine trade.

The current tower was designed by leading Paris architect Louis de Foix and had rooms that served as apartments for its keepers as well as the King’s Apartment. The lighthouse was restored in 1855 and was declared a historical monument in 1862.

5. Kõpu Lighthouse

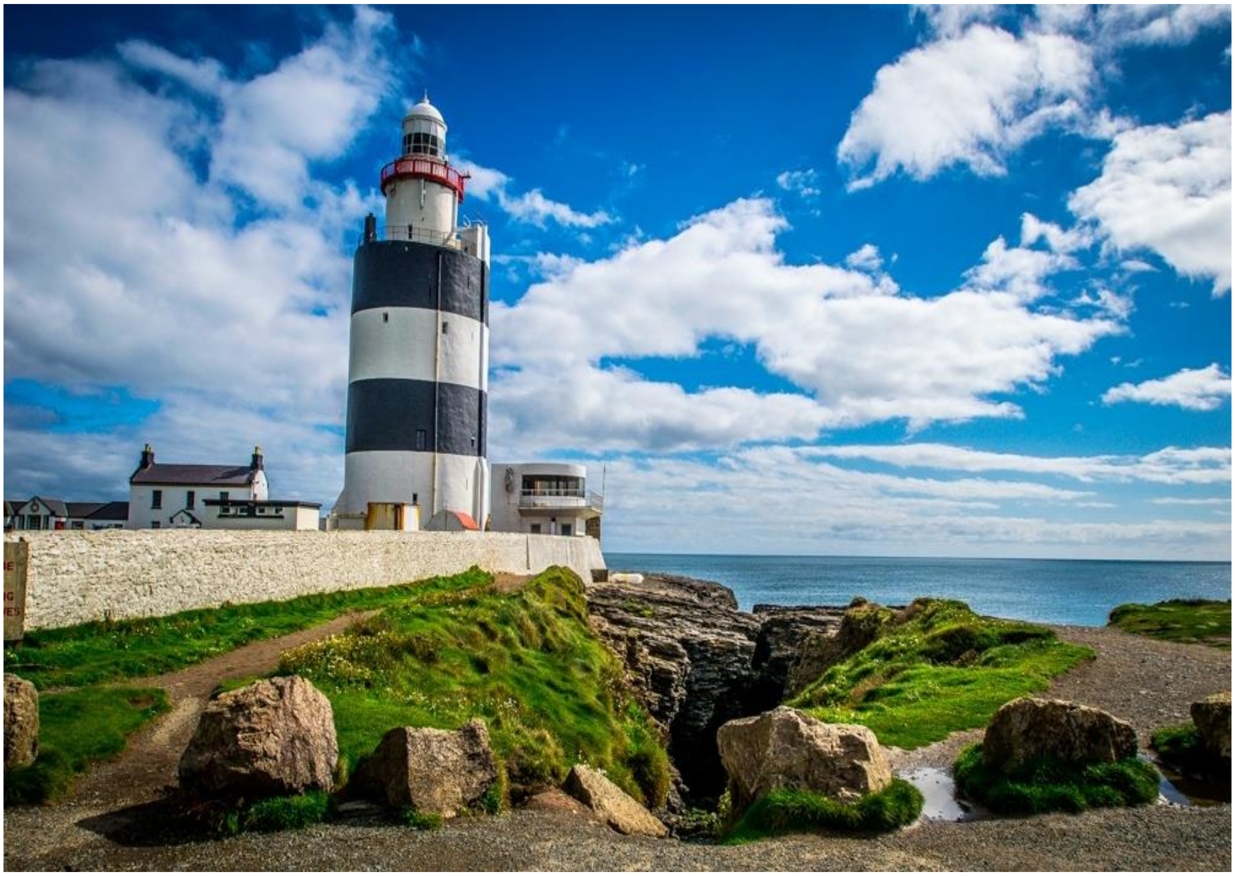
Year Created: 1531, **Location:** Hiiumaa, Estonia, **Height:** 36 m (118 ft), **Still Standing:** Yes



The Kõpu Lighthouse has been in continuous use since it was first built in 1531. The idea for the lighthouse dates back to before 1490 because the most important East–West shipping lane in the Baltic Sea passed the Hiiu sandbank, where the tower is located. Hanseatic merchants had been asking for years to put a landmark on the peninsula and they finally got permission in 1499 from the bishop of Bishopric of Ösel-Wiek. The following year, the bishop agreed to let them build a massive stone pillar without any openings. However, construction was stalled for the next few years after a war broke out.The majority of the tower's construction took place from 1514 – 1519 and a fire was first lit in the fall of 1531. Since then, a few parts of the tower have been reconstructed. Today, Kõpu Lighthouse serves as a symbol of Hiiumaa and is a major tourist attraction.

4. Hook Lighthouse

Year Created: c. 1201 – 1240, **Location:** Hook Head, County Wexford, Ireland, **Height:** 35 m (115 ft)
Still Standing: Yes



Since the Lighthouse of Genoa was rebuilt in 1543, the Hook Lighthouse (also called Hook Head Lighthouse) is the second oldest continuously operating lighthouse in the world. The tower was constructed sometime in the 12th century, but according to Irish tradition, Dubhán, a missionary to the Wexford area, established a form of beacon as early as the 5th century. William Marshall, 2nd Earl of Pembroke wanted to build a lighthouse so ships could safely reach the new port town he established called New Ross. It was constructed of local limestone and the original building is still intact.

The lighthouse's original keepers were monks and today it is remotely controlled from Dún Laoghaire by the Commissioners of Irish Lights. In 2001, the lighthouse opened as a tourist attraction after the old keepers houses were turned into a visitor centre.

3. Lighthouse of Genoa

Year Created: original in 1128; rebuilt in 1543, **Location:** Genoa, Liguria, Italy, **Height:** 76 m (249 ft)
Still Standing: Yes

The Lighthouse of Genoa, simply called Lanterna, has served as symbol and landmark of Genoa, Spain for several centuries. The original lighthouse was built in 1128 (although some sources put the date at 1161) and the current tower was built in 1543. The previous tower had been damaged several times due to various fights and wars. The tower has also been struck by lightning on numerous occasions, and one of its caretakers died from a lightning strike in 1481.

The lighthouse is one of the tallest in the world. It is the fifth tallest overall and the second tallest traditional lighthouse (built of masonry). From 1543 until 1902, it was the tallest lighthouse ever built. In

2004, a museum called the *Museo della Lanterna* was built adjacent to the tower and it was opened to the public in 2006.

2. Tower of Hercules

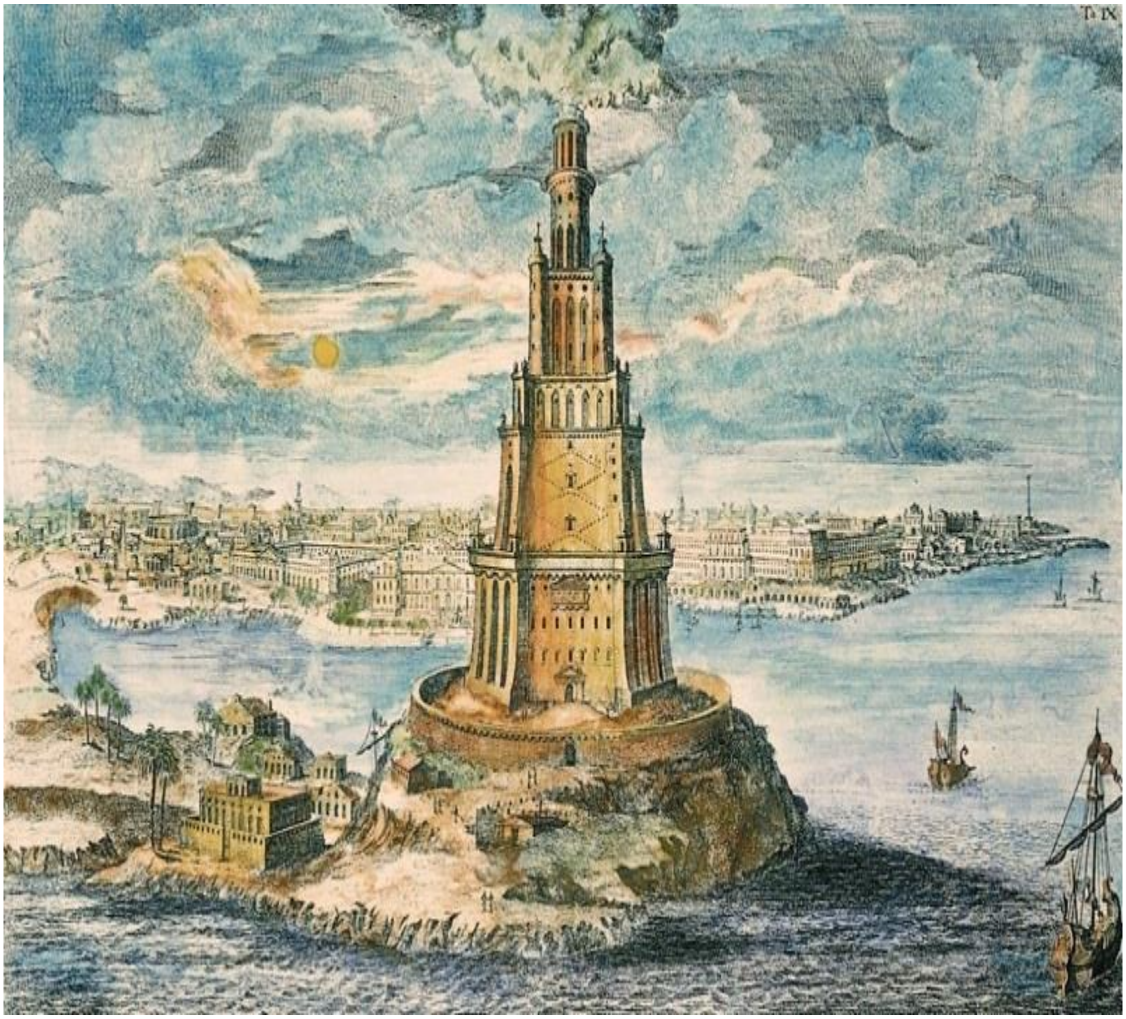
Year Created: c.2nd century CE, **Location:** A Coruña, Galicia, Spain

Height: 57 m (187 ft), **Still Standing:** Yes

Although there were other ancient lighthouses, the Tower of Hercules is the oldest surviving lighthouse in the world. The exact date of the tower's construction is unknown, but records show that it has existed since at least the 2nd century CE. It may have been built or rebuilt by the Roman Emperor Trajan and modeled after the Lighthouse of Alexandria. An inscription on the base of the tower says that its architect was Gaius Sevius Lupus, from Aeminium (present-day Coimbra, Portugal) as an offering dedicated to the Roman god of war, Mars. The tower was restored between 1788 – 1791 and today the lighthouse is a National Monument of Spain. It has also been a UNESCO World Heritage site since 2009.

1. Pharos of Alexandria

Year Created: c.280 – 247 BCE, **Location:** Pharos, Alexandria, Egypt, **Height:** 120 – 137 m (394 – 449 ft), **Still Standing:** No



The Pharos of Alexandria, commonly called the Lighthouse of Alexandria, is the often considered the oldest lighthouse in the world. It was built by the Ptolemaic Kingdom of Ancient Greece sometime between 280 – 247 BCE and was one of the first lighthouses ever built. Construction of the tower first started after Alexander the Great died when Ptolemy I Soter announced himself king in 305 BCE. It took over 12 years to complete and served as the prototype for all future lighthouses.

The lighthouse was one of the Seven Wonders of the Ancient World (it was the third longest surviving ancient wonder) and for many centuries it was one of the tallest man-made structures in the world. Although the lighthouse survived for many centuries, it was badly damaged by several earthquakes – first in 956 CE and then again in 1303 CE and 1323 CE. The tower's final remains disappeared in 1480, when the then-Sultan of Egypt, Qaitbay, built a fort on the larger platform of the lighthouse site using some of the fallen stone.

Lighthouses before the 3rd century

Before the development of clearly defined ports, mariners were guided by fires built on hilltops. Since elevating the fire would improve the visibility, placing the fire on a platform became a practice that led to the development of the lighthouse.[1] In antiquity, the lighthouse functioned more as an entrance marker to ports than as a warning signal for reefs and promontories, unlike many modern lighthouses. The most famous lighthouse structure from antiquity was the Pharos of Alexandria, Egypt, which collapsed following a series of earthquakes between 956 and 1323.

The intact Tower of Hercules at A Coruña, Spain gives insight into ancient lighthouse construction; other evidence about lighthouses exists in depictions on coins and mosaics, of which many represent the lighthouse at Ostia. Coins from Alexandria, Ostia, and Laodicea in Syria also exist.

Of course the lighthouse of Alexandria was not the first in history, but if one retains this one it is for its imposing silhouette and immense size that one rendered without comparison with those that existed before.

The Mediterranean is not particularly rich in lighthouse before the 3rd century, but the Greeks used to build it at the entrance of certain ports. They were fired on fire all day and especially at night. One of the oldest is that of Phanari, from the 6th century BC. Of modest size (2m54), it consists of a cylindrical tower of 3m50 in diameter at the top of which were placed slabs of sandstone on which the appointed persons kept the fire alive. In Piraeus, the port of Athens, there are several vestiges of lighthouses, the oldest of which date from the 5th century BC. On the island of Thasos, in the Aegean Sea, there is also a lighthouse dating from the 6th century BC. All this proves that if the idea of directing ships to the port via lighthouses is not new, that of building a large lighthouse is, and that is the reason for the magnificence of that of Alexandria .

Who is the architect of the Lighthouse of Alexandria?

This is a question that is difficult to answer because the sources are scarce and inaccurate. This monument has long been attributed to Sostratos of Cnidus. He was a powerful man, who had the ears of kings, a close relation to King Ptolemy I and his son. Its name was found on the monument, written in lead characters, as indicated in ancient documents by the Greek geographer Strabo and Lucien, and it was this mention that made all the specialists the origin of the lighthouse. But nowadays this thesis is refuted because such a monument could not have received other mentions than that of King Ptolemy I, which he surely received but of which we have no trace. In fact, a papyrus preserved in the Louvres tells us that the dedication was not intended for the lighthouse but for the statue that overcame it. It is a poem.

This safeguard of the Greeks, that watchman of Pharos, O Lord Proteus, has erected him, son of Dexiphanes of Cnidus, for in Egypt you do not look for heights on islands; at the level of the water stretches the bay where the boats anchor. That is why erect upright, cut out the sky a visible tower at innumerable stages during the day. At night, in the midst of the waves, the sailor will see the great fire which, at the top, burns, and can run straight on the horn of the Tauros, and which navigates in these waters, can not fail, O Proteus, Zeus Savior.

Besides, Sôtratos de Cnide was an ambassador and was a very rich person, one can even imagine that he was the financier of the lighthouse and not his architect. One can tend towards this hypothesis by reading the poet Poseidippos who lived at the time of the construction of the lighthouse and who speaks of Sôstratos like the one who erected the lighthouse but also of Strabo, the Greek geographer, who uses the words "he dedicated "and not" he built ". The first traces of Sôstratos as an architect date from the 1st century AD, in Book XXVI of "Natural History", Pliny the Elder. Is this the beginning of an error that will endure to the present day or the reality? For the time being neither the archaeologists nor the historians have succeeded in answering this question clearly.Note that Cnide was a ruined city on the Turkish coast, facing the island of Rhodes.

If the architect of the lighthouse remains unknown to this day, the place of edification is perfectly known, it is on the island of Pharos, an island which at the time was a short distance from the coast. Since the silts of the Nile have filled the arm of the sea between the two, turning the island into peninsula. The lighthouse was at the eastern end of the island, on the site of Fort Qaitbay. Moreover, the latter was built partially with the stones of the collapsed lighthouse.

This island was at that time more important than it is today. It was higher, roughly 5 to 6 meters, and it had support walls that are always visible in scuba diving. Proof of the location of the Alexandria Lighthouse was provided by teams of French archaeologists who carried out a series of underwater diving in the harbor, as explained below. It should also be noted that Diamond Island was mentioned as a possible place to build the lighthouse, but this hypothesis is now obsolete. In any case, this island is too frightening for it to have received a lighthouse, even after the bombing of 1882 that it received from the English navy.

Duration and cost of work

It is the Souda, a Greek text of the Xth century, which makes it possible to know the date of the beginning of the work, 297. A translation of this text, for Article 113 of the letter Phi, is :

Lighthouse: to the masculine, designates the Lighthouse of Alexandria, that erected under Ptolemy king of Egypt Sostrate of Cnidus, son of Dexiphanes, on Pharos, the island of Proteus, at the time when Pyrrhus the heir Achilles has already received power over Epirus.
This provision being given to him in 297, we have here the date of beginning of the works. They would have lasted only 15 years if one believes the chronology of Eusebius which affirms that it was completed at the time of the 124th Olympiad, under Ptolemy II. It places work between the reigns of Ptolemy I and Ptolemy II, from 297 to 283 BC.

Such a speed in the construction of such a building is quite remarkable, it is a sign both of a good knowledge of the architecture, but also of the financial health of the sponsor, the satrap (governor) of Egypt became king Ptolemy I, who could put the means to finish his monument quickly. At that time it was common to see construction sites stretching for several generations, even if they were not the most frequent cases.

As far as the cost of the lighthouse is concerned, it is estimated by Pliny the Elder to 800 talents of silver (Pliny the Elder lived in the 1st century AD, 4 centuries later). Difficult to make an effective comparison with modern means.

Equipment

The lighthouse of Alexandria was built of limestone from a quarry near the coast. Geologically this area is sufficiently rich in stone to have necessitated the transport of stones from other regions, unless they have explicitly wanted special stones. It could have been the case, such as using marble, but in practice it is indeed limestone that was used. These stones had a clear appearance, which made the visitors say that the lighthouse was white - which is false. Note that the stones of Fort Qaitbay are reusable from those of the lighthouse, so have little to see nowadays what these stones were at the time. Moreover, those found in the port are indeed limestone. But limestone is a soft stone, for a lighthouse it is not a very suitable material. It is easy to imagine that in the 3rd century BC it was difficult to recover more solid stones in other regions, but this is what was done for the part of the lighthouse most at risk: Angles of the building, frames of the doors and windows, which were built of granite from Aswan. One finds such a way of building at Fort Qaitbay.

The fitting of the stones is quite surprising, as far as we know. The description of the assembly of the lighthouse is little known, it is a hypothesis. The manufacturers obviously did not use mortar to tie the stones together but used an old grooving technique. They were visibly assembled on a bed of molten lead, acting as a shock absorber. What is factual is that the rate of lead in the sea around the archaeological site is important, according to Jean-Yves Empereur, the French archaeologist in charge of maritime excavations.

Description. What was the lighthouse like?

In fact it is easy enough to know what the lighthouse of Alexandria looked like, as it is represented many times on ancient documents. Ancient, but not enough to be contemporary with the monument, so there is always a part of interpretation in its representation, however weak. But to be honest, the lighthouse of Alexandria is probably the wonder of the World that is best known, aesthetically speaking, apart from the Pyramid of Cheops, of course.

In 1154 a certain Edrisi made a description of the lighthouse of Alexandria.

One notices the famous lighthouse which has no equivalent in the world in terms of structure and solidity; for, independently of what is made of excellent stones of the kind called caddzan, the foundations of these stones are sealed together with molten lead, and the joints are so adherent that the whole is indissoluble, that the waves of the sea, on the north side, continually strike this edifice. They ascend by a broad staircase, built in the interior, as are ordinarily those which are practiced in the towers of the mosques. The first staircase ends towards the middle of the lighthouse, and there the edifice becomes narrower by its four sides. In the interior and under the staircase were built rooms. Starting from the middle gallery, the lighthouse rises to its summit, narrowing more and more, not beyond, however, that a man can always make the turn while ascending. From this same gallery one ascends again, to reach the summit, by a staircase of dimensions narrower than those of the lower staircase. The lighthouse is pierced, in all its parts, with windows destined to procure daylight for persons ascending, and so that they may properly place their feet in ascending. This edifice is singularly remarkable, on account of its height as well as its solidity; it is very useful in that it lights night and day of fire to serve as a signal to navigators; the people of the ships recognize this fire and are directed accordingly, for it is visible from a maritime day [100 miles] away. During the night, it appears as a brilliant star; during the day one distinguishes the smoke.

Shortly before, in 1117, Al-Andalusi, went to Alexandria and made another description.

The entrance to the Lighthouse is very high. It is accessed by a long 183-meter ramp. This is based on a series of arches [...]. Once we reached the top of the first floor, we measured its height above the ground with a piece of rope to which we attached a stone. We found 57.73 meters [...]. In the center of the terrace of this first floor, the building was prolonged, but with an octagonal shape [...]. This second floor was higher than the first. On entering we saw a staircase which consisted of eighteen steps, and we debouched in the center of the second terrace. The building was still prolonged in a cylindrical form [...]. We entered and ascended thirty-one steps to reach the third floor, the height of which we measured with our rope: 7.32 meters. On the terrace of this third floor, there was a mosque with four doors and a dome.

Dimensions of the lighthouse**.Architecture of the lighthouse of Alexandria**

The lighthouse of Alexandria is a monolithic building that measured 135m high. It was on 3 floors: On the ground, a heavy square building, on which was built another octagonal building. At the top, the third floor was cylindrical. This form with three levels is found in other lighthouses of the Greek Empire, that of Taposiris Magna is an example. The access door was fairly high in relation to the ground, so the lighthouse had an access ramp on the first floor, a ramp which was mounted on sixteen impressive arches. This idea of putting the door up was not an originality, the first buildings to have it were essentially defensive, it made it possible to secure access to the door by removing the ladder, for example. But here it was useless to defend access to the lighthouse, the ramp was therefore hard, not removable.

The first floor was built on a platform about ten meters high, it was pyramidal and square. The building itself was hollow and contained an access ramp on the second floor and about fifty rooms, so it was a real urban complex, not at all a simple block of solid retaining stone. These various rooms were used for the service of the lighthouse. There were rooms for the staff who kept the fire at the top, others for storing wood for its food. The ramp was wide and allowed the passage of oxen to carry the wood towards the top of the lighthouse, it was illuminated by a series of windows, small and long, arranged along the ramp and thus, outwardly offset compared to others. To get a good idea of what was the first floor of the lighthouse it is enough to observe the temple of Osiris, near Alexandria: Built by Ptolemy II, so contemporary, it shows exactly the same structure massive exterior and hollow interior, with many rooms and an internal staircase. This part of the lighthouse was 71m high and at its summit was a terrace equipped with a high railing of 2,30m and carved Tritons blowing in horns, a means of preventing accidents at sea.

The second floor was 34m high, about half the first. It was octagonal in shape and as for the first floor it was hollow, but unlike it it was equipped with an internal staircase, not a ramp. It must be said that at this level the lighthouse was too narrow to make a ramp, so it was at the top of the first floor that the beasts of burden climbed the wood to burn at the top, for the rest of the trip, it had to be done by hand.

The third floor was the lowest, only 9m. It had a cylindrical shape and was equipped with an internal staircase.

The statue of the summit

At the top of the lighthouse there was a statue of Zeus, it is known that it was installed there during the first half of the third century BC. But the different representations of this statue through time leaves a doubt about its replacement during the following centuries. An object found in Asia Minor and representing the lighthouse shows us a statue with a boat oar, which would identify it with Poseidon, the Roman God. It could be credible for two reasons.

- The island of Pharos welcomed a temple to the glory of Poseidon on the western part,
- Egypt was a Roman province.

If it is true that ancient history tells us that Egypt was a province of the Roman Empire, it is not unusual to find a Roman God at the top of the most emblematic tower of Alexandria. But this proposition is not really valid, as the Romans only conquered Egypt three centuries later (30 years BC).

What is more, we find an intaglio (hard stone engraved in hollow) of the first century AD which shows Zeus on the lighthouse, proof that the statue would have remained in its place during 4 centuries. How to be sure of the chronology of the statues set up at this summit? Difficult because the Roman Empire having banished all pagan representations from 391, but in 539 a witness assures that there was a statue of Helios at the top of the lighthouse. Yet the Roman Empire was already Christian, and it seems normal that at this site a statue of Christ should have been implanted.

Note however that there were other statues on the lighthouse, along its base. Some have been found recently, they have been taken out of the waters of the port. One of them would be Queen Berenice represented in Isis with her husband represented in Pharaoh. Isis was a glorified goddess on the island of Pharos, as was Poseidon.

Operation

Little information has been received on the operation of the lighthouse, but there is not much to discover, obviously. The fire was lit on the highest part, the one on which there was the statue. It was important, visibly powerful, and it was maintained day and night. In the daytime, it was the smoke which directed the boats, at night it was the brilliance. It appears that the lighthouse of Alexandria was visible to 50Kms in the round.

In order to feed it, a large quantity of wood had to be stored in the first floor of the tower. A ramp, as indicated in the description, was the inner circle. Oxen were able to circulate there, stepping the trunks regularly for storage. The suite had to be done manually, the stairs becoming too narrow for the beasts of burden. In the course of time it is possible to switch to other fuels, especially oil.

Some sources indicate that the lighthouse was equipped with reflective mirrors to increase its visibility, it seems to be false. In any case, it is not credible, in the current state of knowledge.

The lighthouse stood on the island of Pharos in the harbour of Alexandria and is said to have been more than 350 feet (110 metres) high; the only taller man-made structures at the time would have been the pyramids of Giza. Much of what is known about the structure of the lighthouse comes from a 1909 work by Hermann Thiersch, *Pharos, antike, Islam und Occident*. According to the ancient sources consulted by Thiersch, the lighthouse was built in three stages, all sloping slightly inward; the lowest was square, the next octagonal, and the top cylindrical. A broad spiral ramp led to the top, where a fire burned at night.

Some descriptions report that the lighthouse was surmounted by a huge statue, possibly representing either Alexander the Great or Ptolemy I Soter in the form of the sun god Helios. Though it was well known earlier, the lighthouse does not appear in any list of wonders until the 6th century CE (the earliest list gives the walls of Babylon instead). In the Middle Ages sultan Ahmed ibn Touloun replaced the beacon with a small mosque. The lighthouse was still standing in the 12th century, but by 1477 the Mamlūk sultan Qāʾit Bāy was able to build a fort from its ruins.

In 1994 archaeologist Jean-Yves Empereur, founder of the Centre for Alexandrian Studies (Centre d’Etudes Alexandrines), made an exciting find in the waters off Pharos Island. He had been called in by the Egyptian government to map anything of archaeological significance in this underwater area before a concrete breakwater was erected over the site. He mapped the location of hundreds of huge masonry blocks; at least some of these blocks are believed to have fallen into the sea when the lighthouse was destroyed by an earthquake in the 1300s. A large amount of statuary was also discovered, including a colossal statue of a king dating to the 3rd century BCE that was thought to represent Ptolemy II. A companion statue of a queen as Isis had been discovered nearby in the 1960s, and these statues representing the deified Ptolemy and his wife, Arsinoe, are thought to have been placed just below the lighthouse, facing the entrance to the harbour. Based upon these finds, the Egyptian government abandoned the idea of a breakwater and planned instead an underwater park where divers could view the many statues, stone sphinxes, and remains of the lighthouse.

Evolution of the lighthouse in time, its degradation

It is difficult to follow the lighthouse in time, because the testimonies of this period are missing. It is known that the Emperor Anastasius I (491-518) had renovations of the submerged subsoil to a certain Ammonios. In 670 the French bishop Aroulfe explains in a document the role of the tower of Pharus, its operation, and the reason why it is important to enter safely in the port. He takes the opportunity to point out that the island is surrounded by pious massifs intended to support the banks.

The lighthouse of Alexandria, built at one time, has obviously not undergone any major changes during its existence. In fact, the modifications were essentially natural. It was an earthquake that destroyed the third floor of the lighthouse during the tenth century. Lying on the ground, the summit was never rebuilt. In his place the sultan Ahmed Ibn Tulun, who ruled the city, had an oratory built, giving the lighthouse a mosque role (and in the process, it was the highest mosque in the world). If you observe the minaret that this sultan built in Cairo, you will find that it follows the same architectural form as the lighthouse of Alexandria: Square at the bottom, octagonal at the center and cylindrical at the top.

In 1303 a second earthquake struck him again, more violently. If one believes a writing preserved in Montpellier (Cartular of Montpellier), the exact date of the shake is the 8 of August.

In the year 1303, on the 8th of August, there was a great earthquake in Alexandria, which caused the lighthouse to fall, and the third part of the town to fall.
But the destruction does not seem to have been complete since Ibn Battuta was still able to describe the lighthouse in April 1349.

Having gone to the Lighthouse on my return from the Maghrib in the year 750, I observed that its state of disrepair was such that it was no longer possible to enter it, nor to reach the door giving access to it.
It was only at the end of the 15th century that the lighthouse of Alexandria, or rather what remained of it, was completely dismantled. The stones were then used for the construction of Fort Qaitbay, which guards the entrance of the port of the city still today.

If there are not enough texts explaining how the lighthouse was built and how it went through the centuries, we still have some information thanks to interesting testimonials.As stated above In 670 the French bishop Aroulfe made a description of the site, it is very old. In 870 it was an official in Egypt, a Bagdadi, who made another similar description. The lighthouse was then always used daily.Ali al-Mas'udi, who was born in Baghdad and died in Cairo around 956, was an Arab historian and geographer.

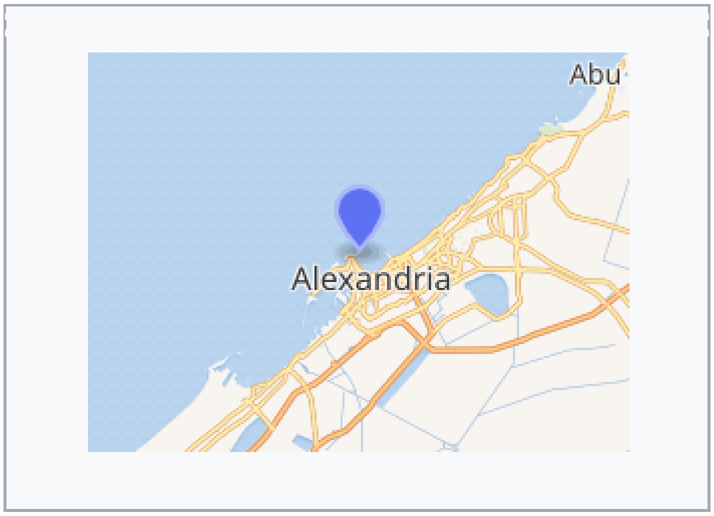
Witness to the slow disappearance of Alexandria due to the various seismic shocks as well as to the subsidence of ground, it describes precisely the damages caused. His narrative gives details of the state of the lighthouse, which is already partly in ruins.

The testimony of Abu al-Haggag Yusuf Ibn Muhammad al-Balawi al-Andalusi is interesting because it dates from the twelfth century, so it is done shortly before the severe destruction of the lighthouse (1303) and sufficiently late to be us without too much deformation. He describes the access ramp, the high door, the general shape of the lighthouse. In the fourteenth century it was Ibn Battuta who took up a similar description, two centuries later.

Permanent disappearance of the lighthouse

Why did the lighthouse of Alexandria disappear? In fact it's quite simple, it has undergone two events. First of all it was abandoned and without maintenance, it is found in the 10th century heavily degraded after an earthquake dropped the 3rd floor. He could no longer serve at that time, and it was a long time ago that he was no longer serving. The lighthouse could have been repaired and consolidated but the Arab civilization of the early Muslim times did not have the magnitude of the previous civilization, so it was impossible for them to correct it. This period lasted until the end of the fifteenth century, when it was so degraded that it was demolished. The stones were recovered and used for the construction of the Qaitbay which guards the entrance of the port of the city still today. So it was at the end of the 15th century that we lost all hope of reviving the lighthouse of Alexandria.

In the port of Alexandria there are vestiges of the lighthouse, the stones that had been damaged in the sea without being able to easily ascend them. Diverse archaeologists work regularly on this site.



Location	Pharos, Alexandria, Egypt
Coordinates	31°12′50″N 29°53′08″ECoordinates: 31°12′50″N 29°53′08″E
Year first	between 284 and 246 BC
Deactivated	1303/1323
Foundation	Stone
Construction	Masonry
Tower shape	Square (below), octagonal (middle) and cylindrical (top)
	Height 47 km (29 mi)

The lighthouse was severely damaged by three earthquakes between AD 956 and 1323 and became an abandoned ruin. It was the third longest surviving ancient wonder (after the Mausoleum at Halicarnassus and the extant Great Pyramid of Giza), surviving in part until AD 1480, when the last of its remnant stones were used to build the Citadel of Qaitbay on the site.

Pharos was a small island located on the western edge of the Nile Delta. In 332 BC Alexander the Great founded the city of Alexandria on an isthmus opposite Pharos. Alexandria and Pharos were later connected by a mole spanning more than 1,200 metres (0.75 miles), which was called the *Heptastadion* ("seven stadia"—a *stadium* was a Greek unit of length measuring approximately 180 m). The east side of the mole became the Great Harbour, now an open bay; on the west side lay the port of Eunostos, with its inner basin Kibotos now vastly enlarged to form the modern harbour. Today's city development lying between the present Grand Square and the modern Ras el-Tin quarter is built on the silt which gradually widened and obliterated this mole. The Ras el-Tin promontory, where Ras el-Tin Palace was built in the 19th century, represents all that is left of the island of Pharos, the site of the lighthouse at its eastern point having been weathered away by the sea.

BC. After Alexander the Great died, the first Ptolemy (Ptolemy I Soter) announced himself king in 305 BC, and commissioned its construction shortly thereafter. The building was finished during the reign of his son, Ptolemy II Philadelphus, and took twelve years to complete at a total cost of 800 talents of silver.[8] The light was produced by a furnace at the top, and the tower was said to have been built mostly with solid blocks of limestone. Although, since the lighthouse was over 300 feet tall the use of limestone as the main material is doubtful due to the possibility of collapsing under its own weight. Rather, pink granite found nearby is more probable as it is much stronger and can withstand more weight. Strabo reported that Sostratus had a dedication to the "Saviour Gods" inscribed in metal letters on the lighthouse. Later Pliny the Elder wrote that Sostratus was the architect, which is disputed.[9] In the second century AD Lucian wrote that Sostratus hid his name under plaster bearing the name of Ptolemy so that when the plaster fell off, Sostratus's name would be visible in the stone.[10][11] Blocks of sandstone and limestone used in construction are analyzed to be from the Wadi Hammamat quarries in the desert east of the city.

Arab descriptions of the lighthouse are consistent despite it undergoing several repairs after earthquake damage. Given heights vary only fifteen percent from c. 103 to 118 m (338 to 387 ft), on a 30 by 30 m (98 by 98 ft) square base.

The fullest description of the lighthouse comes from Arab traveler Abou Haggag Youssef Ibn Mohammed el-Balawi el-Andaloussi, who visited Alexandria in 1166 CE.[12] Balawi provided description and measurement of the interior of the lighthouse's rectangular shaft. The inner ramp was described as roofed with masonry an 7 shibr (189 cm, 6.2 ft) noted as to allow two horsemen to pass at once. In clockwise rotation the ramp held four stories with having eighteen, fourteen, and seventeen rooms on the second, third, and fourth floors, respectively. Balawai account the base of the lighthouse to be 45 ba (30 m, 100 ft) long on each side with connecting ramp 600 dhira (300 m, 984 ft) long by 20 dhira (10 m, 32 ft) wide. Continuing the octangle section is accounted at 24 ba (16.4 m, 54 ft) in width with the diameter of the cylindrical section 12.73 ba (8.7 m, 28.5 ft). The apex of the lighthouse's oratory was measured with diameter 6.4 ba (4.3 m 20.9 ft).

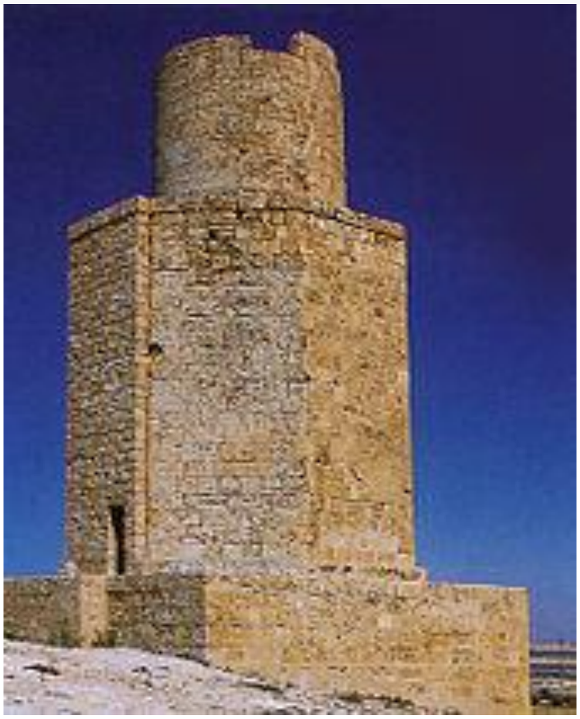
The Arab authors indicate that the lighthouse was constructed from large blocks of light-coloured stone. The tower was made up of three tapering tiers: a lower square section with a central core; a middle octagonal section; and, at the top, a circular section. Ancient accounts from geographer Al-Idrisi accounts admiration from his viewing of the lighthouse in 1154. Al-Idrisi accounts the construction, openings in the walls throughout the rectangular shaft with lead used as a filling agent in between the masonry blocks at the base. Al-Idrisi accounted the total height of the lighthouse to be 300 dhira rashashl (162 m equivalence).

At its apex was positioned a mirror which reflected sunlight during the day; a fire was lit at night. Extant Roman coins struck by the Alexandrian mint show that a statue of Triton was positioned on each of the building's four corners, and a statue of Poseidon or Zeus stood atop.

Al-Masudi wrote in the 10th century CE that the seaward-facing side featured an inscription dedicated to Zeus. Late accounts of the lighthouse after the destruction of the 1303 Crete earthquake include Ibn Battuta, a Moroccan scholar and explorer, who passed through Alexandria in 1326 and 1349. Battuta noted that the wrecked condition of the lighthouse was then only noticeable by the rectangle tower and entrance ramp. Battuta's account measured each side of the tower to be 140 shibr (30.8 m, 101 ft) on either side. Battuta detailed plans of Sultan An-Nasir Muhammad to build a new lighthouse near the site of the collapsed one, but the plans were never fulfilled after the sultan's death in 1341.

The Lighthouse in Culture

The lighthouse as depicted in the Book of Wonders, a late 14th century Arabic text



The Pharos of Abusir, an ancient funerary monument thought to be modelled after the Pharos at Alexandria, with which it is approximately contemporaneous

The lighthouse remains a civic symbol of the city of Alexandria and of the Alexandria Governorate with which the city is more or less coterminous. A stylised representation of the lighthouse appears on the flag and seal of the Governorate and on many public services of the city, including the seal of Alexandria University.

In architecture

- A well-preserved ancient tomb in the town of Abusir, 48 kilometres (30 mi) southwest of Alexandria, is thought to be a scaled-down model of the Alexandria Pharos. Known colloquially under various names – the *Pharos of Abusir*, the *Abusir funerary monument* and Burg al-Arab (Arab's Tower) – it consists of a 3-storey tower, approximately 20 metres (66 ft) in height, with a square base, an octagonal midsection and cylindrical upper section, like the building upon which it was apparently modelled. It dates to the reign of Ptolemy II (285–246 BC), and is therefore likely to have been built at about the same time as the Alexandria Pharos.
- The design of minarets in many early Egyptian Islamic mosques followed a three-stage design similar to that of the Pharos, attesting to the building's broader architectural influence.[24]

- The George Washington Masonic National Memorial, located in Alexandria, Virginia, is fashioned after the ancient Lighthouse.

In literature

- Julius Caesar, in his *Civil Wars* (Part III, 111–112), describes the Pharos and its strategic importance. Gaining control of the lighthouse helped him subdue Ptolemy XIII's armies (48 BC):

  > Now because of the narrowness of the strait there can be no access by ship to the harbour without the consent of those who hold the Pharos. In view of this, Caesar took the precaution of landing his troops while the enemy was preoccupied with fighting, seized the Pharos and posted a garrison there. The result was that safe access was secured for his corn supplies and reinforcements.

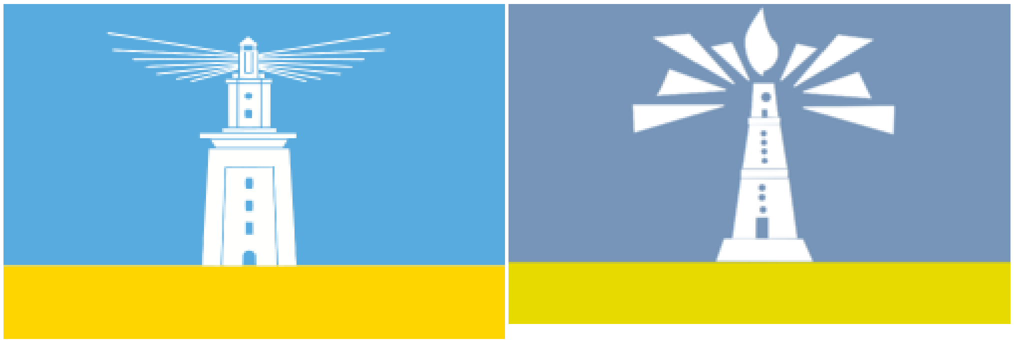
- The Romano-Jewish historian Josephus (37 – c.100 AD) describes it in his book *The Jewish War* (4.10.5) when he gives a geographical overview of Egypt.
- It was described in the *Zhu fan zhi* ("Records of Foreign Peoples") by Zhao Rugua (1170–1228), a Chinese customs inspector for the southern port city of Quanzhou during the Song dynasty.
- Ibn Battuta visited the lighthouse in 1326, finding "one of its faces in ruins," yet he could enter and noted a place for the guardian of the lighthouse to sit and many other chambers. When he returned in 1349, he "found that it had fallen into so ruinous a condition that it was impossible to enter it or to climb up to the doorway."
- In Robert Silverberg's science fiction novella *Sailing to Byzantium* (1985), a culture of the far future recreates ancient cities, full with every detail, among them Alexandria; several episodes of Silverberg's story take place on the rebuilt Pharos.

In video games

- The lighthouse was one of the Wonders of the World that could be built in the 1991 computer game Civilization, giving a bonus to ship movement. It would appear again in all the latter installments of the series.
- It can be built as a monument in the city building strategy games *Pharaoh: Cleopatra* (2000)[29][30][31] and *Children of the Nile* (2004).
- The lighthouse is featured as a wonder in the 2013 strategy game, *Total War: Rome II*, where it gives a minor boost to the faction occupying Alexandria.
- The lighthouse was featured in the action-adventure video game *Assassins Creed Origins* released on October 27, 2017. It is set in Ancient Egypt during the Ptolemaic period (48 BC). Ubisoft Montreal's

research on Ancient Egypt was done with the help of French archaeologist and Egyptologist Jean-Claude Golvin.

- The lighthouse can be built in the SimCity 3000 game as a landmark.
- The Lighthouse of Alexandria is a "Great Building" available in the web-based game Forge of Empires.



The Flag of the Alexandria Governate/ Flag of the city of Alexandria

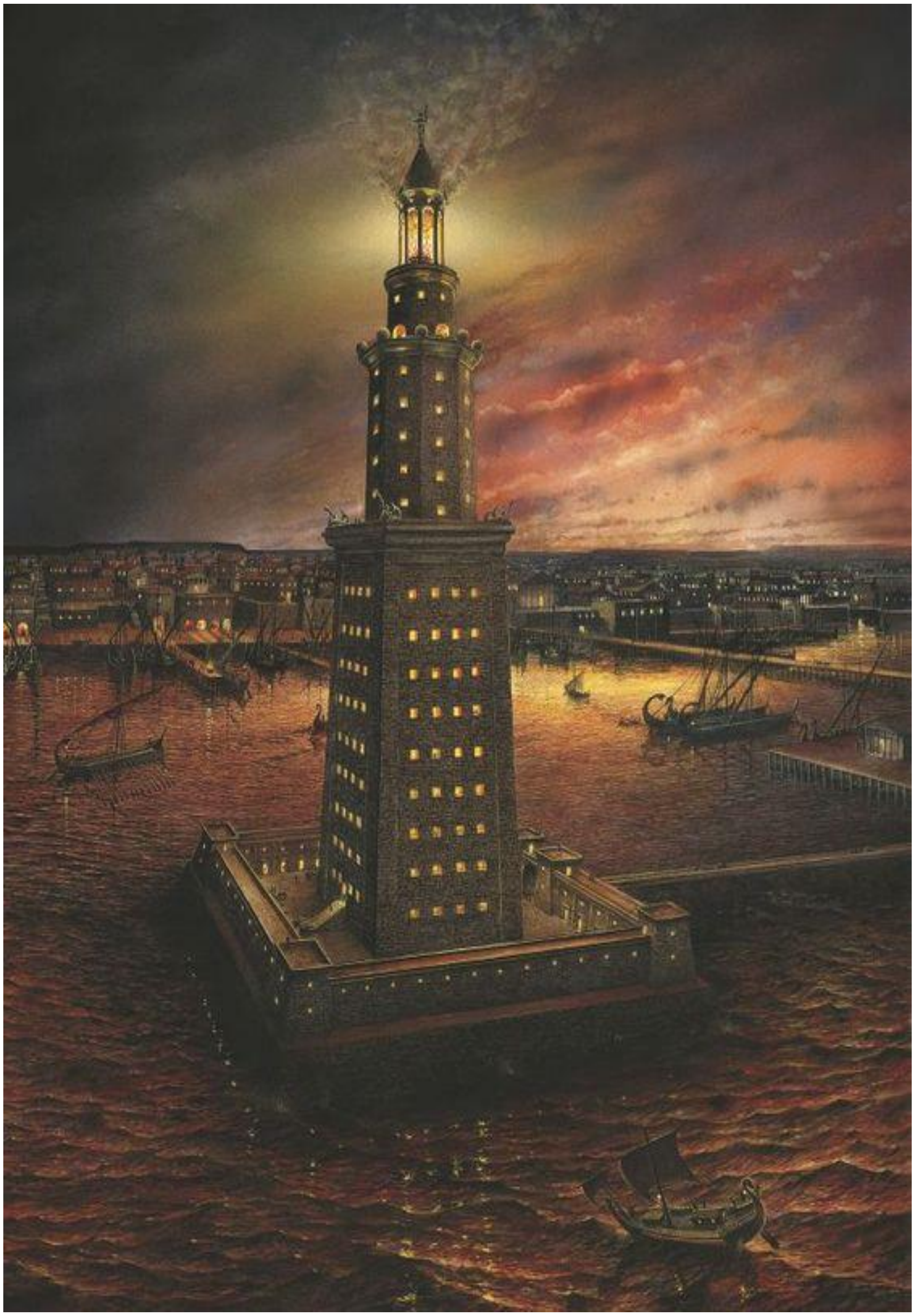
This term refers to the .5 km causeway (Haas, 2001) that linked the mainland of Alexandria to the island of Pharos (this was also the name for the lighthouse on the island, see Pharos). Thus, the causeway cleaved Alexandria's oceanfront into "two distinct harbors, which were more easily protected from the force of the strong coastal current: the Eastern or Great Harbor and the Western Harbor" (Haas, 1997).

REFERENCES

1.Portraits of the Ptolemies: Greek Kings as Egyptian Pharaohs,By Paul Edmund Stanwick

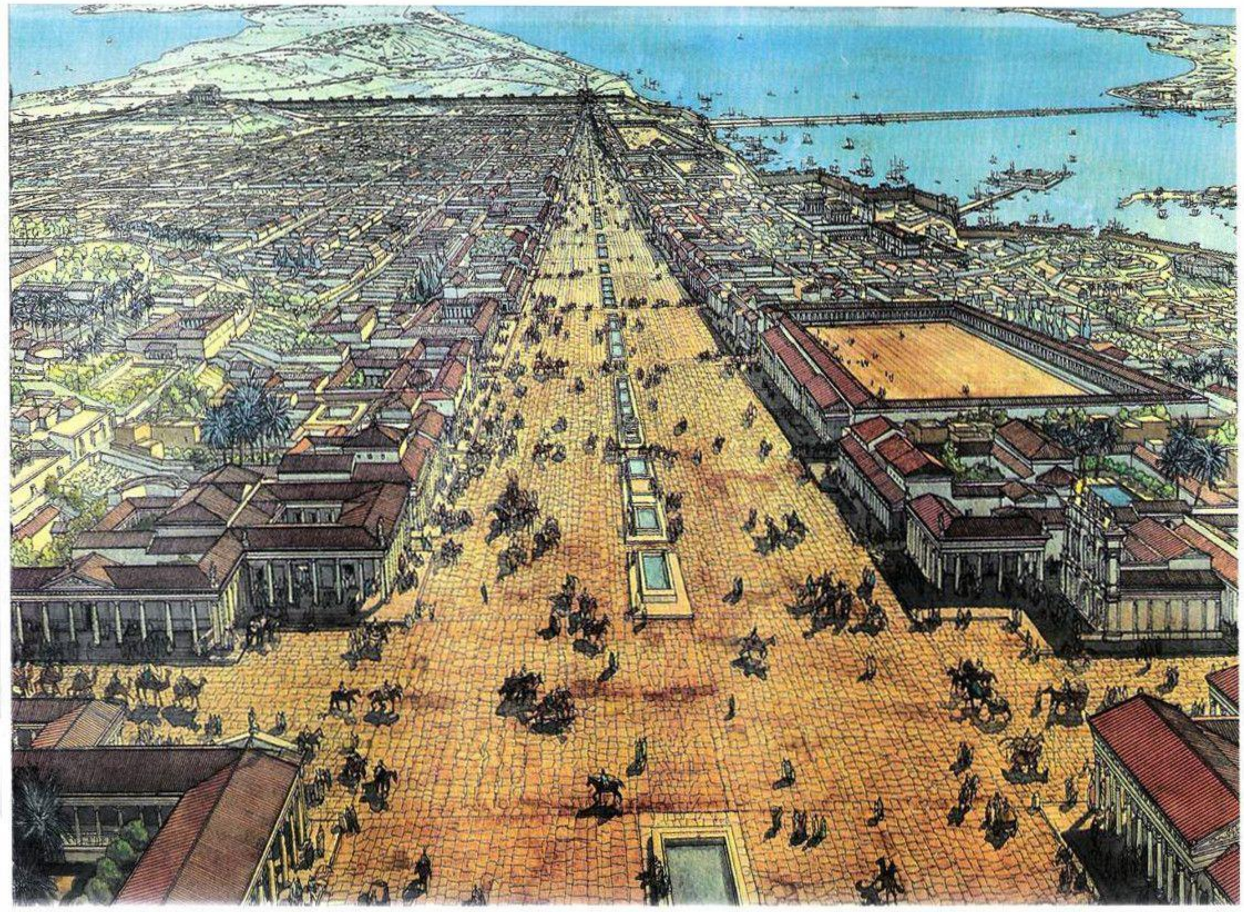
2. The Architecture of Alexandria and Egypt, C. 300 B.C. to A.D. 700, Volume 63, Yale University Press

3. Portraits of the Ptolemies: Greek Kings as Egyptian Pharaohs, Paul Edmund Stanwick, University of Texas Press



CHAPTER III

The History of Alexandria



The **history of Alexandria** dates back to the city's founding, by Alexander the Great, in 331 BC. Yet, before that, there were some big port cities just east of Alexandria, at the western edge of what is now Abu Qir Bay. The Canopic (westernmost) branch of the Nile Delta still existed at that time, and was widely used for shipping.

After its foundation, Alexandria became the seat of the Ptolemaic Kingdom, and quickly grew to be one of the greatest cities of the Hellenistic world. Only Rome, which gained control of Egypt in 30 BC, eclipsed Alexandria in size and wealth.

The city fell to the Arabs in AD 641, and a new capital of Egypt, Fustat, was founded on the Nile. After Alexandria's status as the country's capital ended, it fell into a long decline, which by the late Ottoman period, had seen it reduced to little more than a small fishing village. The French army under Napoleon captured the city in 1798 and the British soon captured it from the French, retaining

Alexander died before Alexandria was founded

Alexandria within their sphere of influence for 150 years. The city grew in the early 19th century under the industrialization program of Mohammad Ali, the viceroy of Egypt.

The current city is the Republic of Egypt's leading port, a commercial, tourism and transportation center, and the heart of a major industrial area where refined petroleum, asphalt, cotton textiles, processed food, paper, plastics and styrofoam are produced.

Just east of Alexandria in ancient times (where now is Abu Qir Bay) there was marshland and several islands. As early as the 7th century BC, there existed important port cities of Canopus and Heracleion. The latter was recently rediscovered under water. Part of Canopus is still on the shore above water, and had been studied by archaeologists the longest. There was also the town of Menouthis. The Nile Delta had long been politically significant as the point of entry for anyone wishing to trade with Egypt.

An Egyptian city or town, Rhakotis, existed on the shore where Alexandria is now. Behind it were five villages scattered along the strip between Lake Mareotis and the sea, according to the *Romance of Alexander*.

Alexander the Great Founding Alexandria by Placido Costanzi (1736-1737)

Alexandria was founded by Alexander the Great in 331 BC (the exact date is disputed) as Ἀλεξάνδρεια (*Aleksándreia*). Alexander's chief architect for the project was Dinocrates. Ancient accounts are extremely numerous and varied, and much influenced by subsequent developments. One of the more sober descriptions, given by the historian Arrian, tells how Alexander undertook to lay out the city's general plan, but lacking chalk or other means, resorted to sketching it out with grain. A number of more fanciful foundation myths are found in the Alexander Romance and were picked up by medieval historians.

A few months after the foundation, Alexander left Egypt for the East and never returned to his city. After Alexander departed, his viceroy, Cleomenes, continued the expansion of the city.

In a struggle with the other successors of Alexander, his general, Ptolemy (later Ptolemy I of Egypt) succeeded in bringing Alexander's body to Alexandria. Alexander's tomb became a famous tourist destination for ancient travelers (including Julius Caesar). With the symbols of the tomb and the Lighthouse, the Ptolemies promoted the legend of Alexandria as an element of their legitimacy to rule.

Alexandria was intended to supersede Naucratis as a Hellenistic center in Egypt, and to be the link between Greece and the rich Nile Valley. If such a city was to be on the Egyptian coast, there was only one possible site, behind the screen of the Pharos island and removed from the silt thrown out by the Nile, just west of the westernmost "Canopic" mouth of the river. At the same time, the city could enjoy a fresh water supply by means of a canal from the Nile. The site also offered unique protection against invading armies: the vast Libyan Desert to the west and the Nile Delta to the east.

Though Cleomenoes was mainly in charge of seeing to Alexandria's continuous development, the *Heptastadion* (causeway to Pharos Island) and the main-land quarters seem to have been mainly Ptolemaic work. Demographic details of how Alexandria rose quickly to its great size remain unknown.

Ptolemaic Era: Inheriting the trade of ruined Tyre and becoming the center of the new commerce between Europe and the Arabian and Indian East, the city grew in less than a generation to be larger than Carthage. In a century, Alexandria had become the largest city in the world, and for some centuries more, was second only to Rome. It became the main Greek city of Egypt, with an extraordinary mix of Greeks from many cities and backgrounds. Nominally a free Hellenistic city, Alexandria retained its senate of Roman times and the judicial functions of that body were restored by Septimius Severus after temporary abolition by Augustus.

Construction

Monumental buildings were erected in Alexandria through the third century BC. The Heptastadion connected Pharos with the city and the Lighthouse of Alexandria followed soon after, as did the Serapeum, all under Ptolemy I. The Museion was built under Ptolemy II; the Serapeum expanded by Ptolemy III Euergetes; and mausolea for Alexander and the Ptolemies built under Ptolemy IV.

Library of Alexandria

The Ptolemies fostered the development of the Library of Alexandria and associated Musaeum into a renowned center for Hellenistic learning.

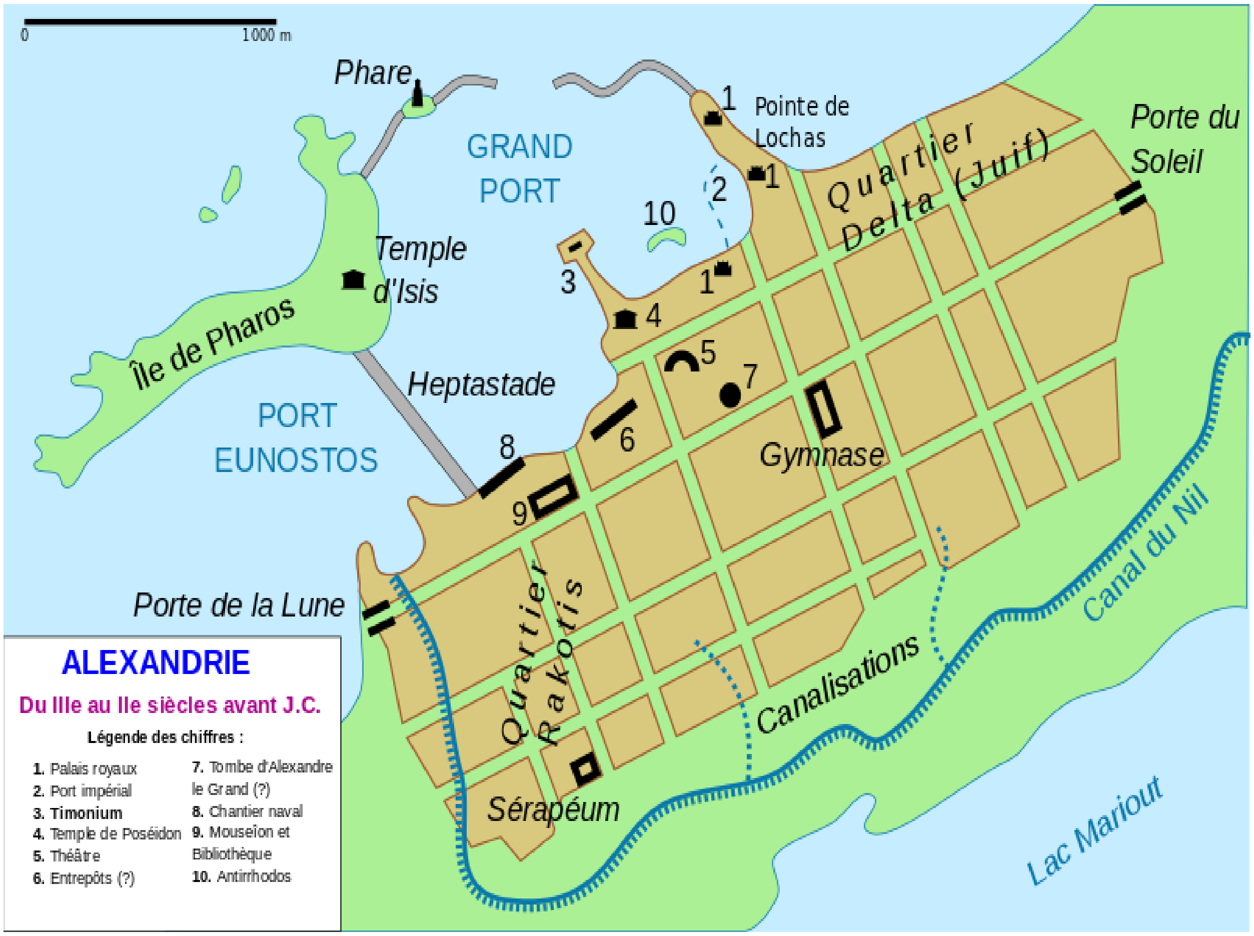
Luminaries associated with the Musaeum included the geometry and number-theorist Euclid; the astronomer Hipparchus; and Eratosthenes, known for calculating the Earth's circumference and for his algorithm for finding prime numbers, who became head librarian.

Strabo lists Alexandria, with Tarsus and Athens, among the learned cities of the world, observing also that Alexandria both admits foreign scholars and sends its natives abroad for further education.

Ethnic divisions

The early Ptolemies were careful to maintain the distinction of its population's three largest ethnicities: Greek, Jewish, and Egyptian. (At first, Egyptians were probably the plurality of residents, while the Jewish community remained small. Slavery, a normal institution in Greece, was likely present but details about its extent and about the identity of slaves are unknown). Alexandrian Greeks placed an emphasis on Hellenistic culture, in part to exclude and subjugate non-Greeks.

The law in Alexandria was based on Greek—especially Attic—law. There were two institutions in Alexandria devoted to the preservation and study of Greek culture, which helped to exclude non-Greeks. In literature, non-Greek texts entered the library only once they had been translated into Greek. Notably, there were few references to Egypt or native Egyptians in Alexandrian poetry; one of the few references to native Egyptians presents them as "muggers." There were ostentatious religious processions in the streets that displayed the wealth and power of the Ptolemies, but also celebrated and affirmed Greekness. These processions were used to shout Greek superiority over any non-Greeks that were watching, thereby widening the divide between cultures.



From this division arose much of the later turbulence, which began to manifest itself under the rule of Ptolemy Philopater (221–204 BC). The reign of Ptolemy VIII Physcon from 144–116 BC was marked by purges and civil warfare (including the expulsion of intellectuals such as Apollodorus of Athens), as well as intrigues associated with the king's wives and sons.

Alexandria was also home to the largest Jewish community in the ancient world. The Septuagint, a Greek translation of the Hebrew Bible (the Torah and other writings), was produced there. Jews occupied two of the city's five quarters and worshipped at synagogues.

The city passed formally under Roman jurisdiction in 80 BC, according to the will of Ptolemy Alexander but only after it had been under Roman influence for more than a hundred years. Julius Caesar dallied with Cleopatra in Alexandria in 47 BC and was besieged in the city by Cleopatra's brother and rival. His example was followed by Mark Antony, for whose favor the city paid dearly to Octavian. Following Antony's defeat in Alexandria at the Battle of Actium, Octavian took Egypt as personal property of the emperor, appointing a prefect who reported personally to him rather than to the Roman

Senate. While in Alexandria, Octavian took time to visit Alexander's tomb and inspected the late king's remains. On being offered a viewing into the tombs of the pharaohs, he refused, saying, "I came to see a king, not a collection of corpses."

From the time of annexation and onwards, Alexandria seemed to have regained its old prosperity, commanding, as it did, an important granary of Rome. This was one of the chief reasons that induced Octavian to place it directly under imperial power.

Jewish–Greek ethnic tensions in the era of Roman administration led to riots in AD 38 and again in 66. Buildings were burned during the Kitos War (*Tumultus Iudaicus*) of AD 115, giving Hadrian and his architect, Decriannus, an opportunity to rebuild.

In 215 AD the emperor Caracalla visited the city and, because of some insulting satires that the inhabitants had directed at him, abruptly commanded his troops to put to death all youths capable of bearing arms. This brutal order seems to have been carried out even beyond the letter, for a general massacre ensued. According to historian Cassius Dio, over 20,000 people were killed.

In the 3rd century AD, Alexander's tomb was closed to the public, and now its location has been forgotten.

Late Roman and Byzantine period

Even as its main historical importance had sprung from pagan learning, Alexandria now acquired new importance as a center of Christian theology and church government. There, Arianism came to prominence, and there also Athanasius opposed Arianism and the pagan reaction against Christianity, experiencing success against both and continuing the Patriarch of Alexandria's major influence on Christianity into the next two centuries.

Persecution of Christians under Diocletian (beginning in AD 284) marks the beginning of the Era of Martyrs in the Coptic calendar.

As native influences began to reassert themselves in the Nile valley, Alexandria gradually became an alien city, more and more detached from Egypt and losing much of its commerce as the peace of the empire broke up during the 3rd century, followed by a fast decline in population and splendor.

In 365, a tsunami caused by an earthquake in Crete hit Alexandria.

In the late 4th century, persecution of pagans by Christians had reached new levels of intensity. Temples and statues were destroyed throughout the Roman empire: pagan rituals became forbidden under punishment of death, and libraries were closed. In 391, Emperor Theodosius I ordered the destruction of all pagan temples, and the Patriarch Theophilus complied with his request. The Serapeum of the Great

Library was destroyed, possibly effecting the final destruction of the Library of Alexandria.[18][19] The neoplatonist philosopher Hypatia was publicly murdered by a Christian mob.

The Brucheum and Jewish quarters were desolate in the 5th century, and the central monuments, the *Soma* and Museum, fell into ruin. On the mainland, life seemed to have centered in the vicinity of the *Serapeum* and *Caesareum*, both which became Christian churches. The *Pharos* and *Heptastadium* quarters, however, remained populous and were left intact.

Recent archaeology at *Kom El Deka* (heap of rubble or ballast) has found the Roman quarter of Alexandria beneath a layer of graves from the Muslim era. The remains found at this site, which are dated circa the fourth to seventh centuries AD, include workshops, storefronts, houses, a theater, a public bath, and lecture halls, as well as Coptic frescoes. The baths and theater were built in the fourth century and the smaller buildings constructed around them, suggesting a sort of urban renewal occurring in the wake of Diocletian.

Lighthouse of Alexandria represented in the 14th century Book of Wonders

Further information: Islamic conquest of Egypt, Fatimids, Ayyubid dynasty, and Mamluk Sultanate (Cairo)

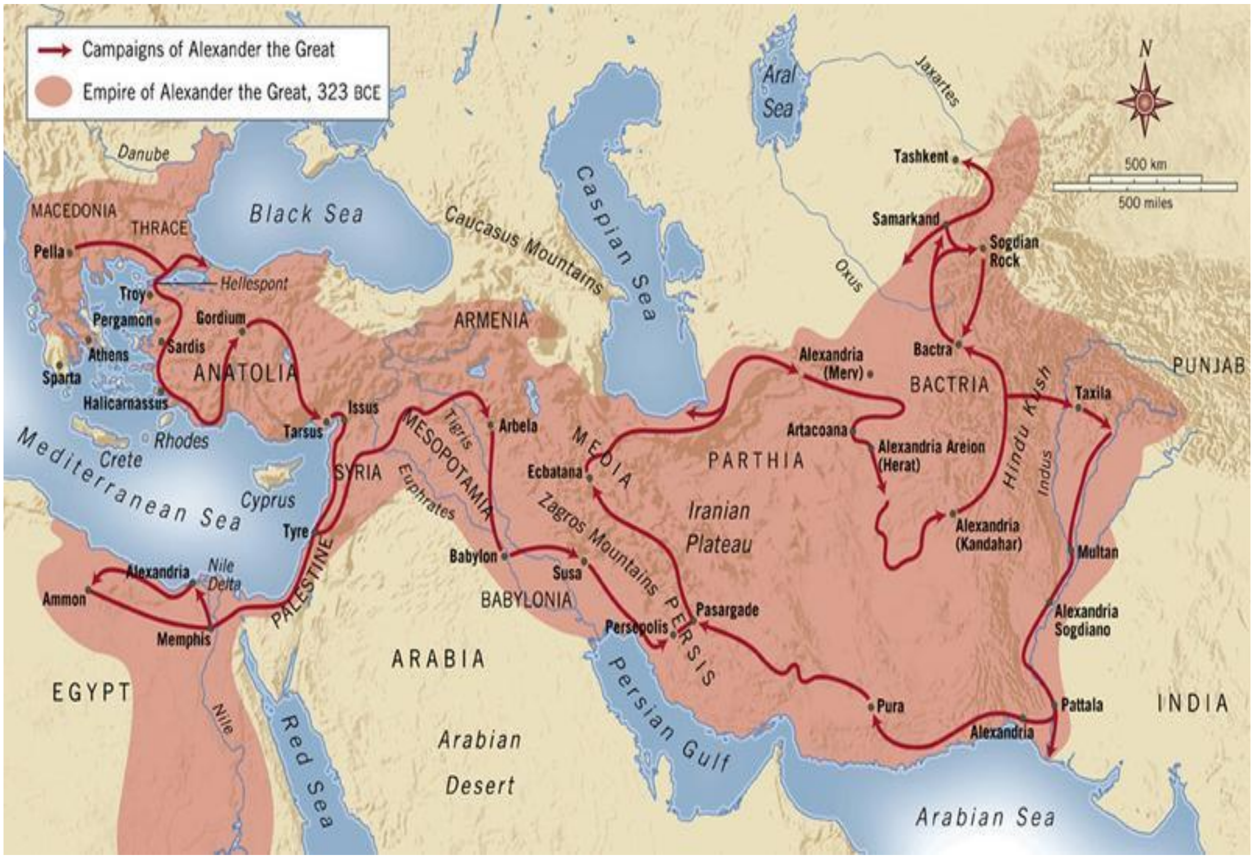
In 616, the city was taken by Khosrau II, King of Persia. Although the Byzantine emperor Heraclius recovered it a few years later, in 641 the Arabs, under the general Amr ibn al-

As during the Muslim conquest of Egypt, captured it decisively after a siege that lasted fourteen months. The city received no aid from Constantinople during that time; Heraclius was dead and the new Emperor Constans II was barely twelve years old. In 645 a Byzantine fleet recaptured the city, but it fell for good the following year. Thus ended a period of 975 years of the Greco-Roman control over the city. Nearly two centuries later, between the years 814 and 827, Alexandria came under the control of pirates of Andalusia (Spain today), later to return to Arab hands. In the year 828, the alleged body of Mark the Evangelist was stolen by Venetian merchants, which led to the Basilica of Saint Mark. Years later, the city suffered many earthquakes during the years 956, 1303 and then in 1323. After a long decline, Alexandria emerged as major metropolis at the time of the Crusades and lived a flourishing period due to trade with agreements with the Aragonese, Genoese and Venetians who distributed the products arrived from the East through the Red Sea. It formed an emirate of the Ayyubid Empire, where Saladin's elder brother Turan Shah was granted a sinecure to keep him from the front lines of the crusades. In the year 1365, Alexandria was brutally sacked after being taken by the armies of the Crusaders, led by King Peter of Cyprus. The fourteenth and fifteenth centuries, Venice has eliminated the jurisdiction and its Alexandrian warehouse became the center of the distribution of spices to the Portuguese Cape route to open in 1498, which marks the commercial decline, worsened by the Turkish invasion.

There has been a persistent belief that the Library of Alexandria and its contents were destroyed in 642 during the Arab invasion.

The Lighthouse was destroyed by earthquakes in the 14th century and by 1700 the city was just a small town amidst the ruins.

Though smaller, the city remained a significant port for Mediterranean trade well through the medieval period, under the Mamluk sultanate, playing a part in the trade network of Italian city-states. However, it declined still further under the Ottoman Empire, losing its water supply from the Nile, and its commercial importance, as Rosetta (Rashid) became more useful as a port.



Alexander’s Campaigns

R E F E R E N C E S

1. Jean-Daniel Stanley, https://www.geosociety.org/gsatoday/archive/17/8/pdf/i1052-5173-17-8-4.pdf
2. Ptolemy of Egypt,Walter M. Ellis,Routledge, 2003

CHAPTER IV

The Harbour

Heptastadion : In 1996 a large team of geophysicists from the CNRS an the University of Paris VI began a project to trace causeway that connected the island of Pharos to the mainland. It now lies under several metres of accumulated silt and soil upon which the Ottomans built their town from 1517 onwards.

Working only from the surface of the modern street network and analysing underground anomalies by means of electric, magnetic, electromagnetic, seismic and radar readings, the specialists managed to rediscover the line of the Heptastadion and correct that which had traditionally been accepted. Their findings show that this causeway was integrated into the road network of the ancient city. Initial results have been published in Etudes Alexandrines 1 and a more complete study is now being prepared for publication. Future developments over the coming years are envisaged as a series of soundings to verify the readings along the line of this causeway. The Heptastadion was a giant causeway, often referred to as a mole or a dyke built by the people of Alexandria, Egypt in the 3rd century BC during the Ptolemaic period. The Heptastadion was created to link Pharos Island to the mainland coast and given a name based on its length (Heptastadion is Greek for "seven stadia"— *hepta* meaning seven, and a stadion being a Greek unit of length measuring approximately 180 m). Overall it was more than three-quarters of a mile long.

Though it is true that Alexander the Great founded of the city of Alexandria in April 331 BC on the site of the small fishing village of Rhacotis as the marine base for his fleet**.** Results from the application of diverse geological methodologies in this study provide consistent data on five distinct and diverse components in radiocarbon-dated East Harbor cores: ceramics, allochthonous rock fragments, lead concentration, heavy minerals, and organic matter, which all increase substantially in the same upper part of the Middle Sand (III) unit dated to ca. 3000 yr ago. a coastal population flourished in this area during Egypt’s Intermediate (ca. B.C. 1000) and Late Dynastic (pre-Ptolemaic) periods. In summary, evidence from East Harbor cores shows that Alexandria did not grow from a barren desert, but was built atop an active town that had for centuries exploited the safe harbor setting along this Egyptian coast. Beyond providing a preliminary insight into the early settlement’s history, it is expected that the investigation findings will provide impetus for further geoarchaeological exploratory efforts in this historically rich region. [1]

The city was built on a narrow limestone ridge opposite to Pharos Island where the Pharos lighthouse would later stand. Forces under Alexander's command cleared the sand and silt deposits which made the port unnavigable, and Alexander's engineer Dinocrates linked the port of Alexandria and the island of Pharos with a bridge 1200 meters long and 200 meters wide, creating two harbour basins for commercial and military shipping. The northeast basin (currently the Eastern harbour) was designed for military vessels and the southwest basin (currently the main port of Alexandria) was for commercial use.

In the Ptolemeic period the lighthouse was constructed on the orders of Ptolemy I and II. It is probable that Ptolemy I was also responsible for the building of the Heptastadion.[6] The causeway formed a barrier further separating the two harbours of Alexandria's oceanfront. This arrangement had the advantage of protecting the harbours from the force of the strong westerly coastal current. The east side of the mole became the *Portus Magnus* (the Great Harbour or Royal Harbour), now an open bay. The west side became the *Portus Eunostus* (the commercial harbour), with its inner basin Kibotos, now vastly enlarged to form the modern harbour Two channels with bridges above were let under the causeway to allow access between the two ports. Julius Caesar ordered these channels to be blocked during the Alexandrian War. The Heptastadion is also believed to have served as an aqueduct while Pharos was inhabited, and geophysical research indicates that it was part of the road network of the ancient city.

Due to silting over the years, the former dyke now lies under several metres of accumulated silt and soil which form the Mansheya isthmus, upon which the Ottomans built their town from 1517 onwards. Today's city development lying between the present Grand Square and the modern Ras el-Tin quarter is built on the silt which gradually widened and obliterated the mole.

Archaeological investigations carried out in Alexandria Bay by Franck Goddio of the European Institute for Underwater Archaeology have revealed the harbour complex from the time of the first Ptolemies (/16/). These royal ports sheltered the Ptolemies' fleets of warships consisting of several hundred galleys, some of which were extraordinarily large. The complex consists of three ports, probably built between 300 and 250 BC during the Hellenistic period, more than 200 years before the arrival of Julius Caesar in 48 BC They are thus much older than most harbours that have been studied so far, such as Caesarea Maritima (Israel).

Unfortunately there are no extant documents from the period concerning the design of these ports, and we are now forced to make assumptions on the basis of present knowledge and on the principal ancient text concerning maritime structures, by the Roman author Vitruvius.

The main aspects that are of interest to the harbour design specialist are as follows:

- **Choice of site**. A port is not built simply anywhere. It forms an interface between land and sea and its location depends on traffic in these two areas and on certain natural conditions.
- **Overall layout**. The layout of a port depends on navigation conditions (winds and waves) and on the types of ship that use it (merchant ships, galleys). The size of the ships defines the acceptable wave-induced disturbance and the possible need to build a breakwater providing protection against storms. The number of ships using the port defines the length of quays and the area of the basins required.
- **Harbour structures**. The ships' draught defines the depth at the quayside and thus the height and structure of the quay. Locally available materials (wood, stone and mortar) and construction methods define the specific structures for a region and historical period.

Choice of Site: In a hurry to conquer the world, Alexander the Great cannot have appreciated the fact that the Phoenician city of Tyre resisted for 8 months (January-August 332 BC) before he was able to take it. He had to build a causeway linking the island to the mainland and call on the help of Tyre's rivals to succeed in his enterprise. The similarity between the island of Tyre and the island of Pharos is striking, especially when one adds that Alexander built a causeway between the island and the mainland at both sites, and that they both have a double harbour.

The idea of building a double harbour is motivated by the fact that there are two main wind and offshore wave directions.

In this case, which is quite frequent, it is useful to be able to move ships from one harbour to the other in order to obtain the best protection against wave disturbance in all circumstances. After the construction of the Heptastadium, the island of Pharos became a peninsula that perfectly fulfilled this criterion:

- to the west was built the Port of Eunostos (which became the commercial harbour),
- to the east was built Magnus Portus (the royal harbour),

and, the ultimate subtlety, ships could be transferred from one to the other without going out to sea, via canals cutting through the Heptastadium. Nevertheless, it should be noted that the western part of Alexandria Bay must have begun to silt up progressively after the construction of the Heptastadium, eventually resulting in the curved shoreline that exists today in this part of the bay.

It is likely that other considerations unrelated to the harbour itself also influenced the choice of site, but it is clear today that the island of Pharos was certainly better than Canopus (present-day Abu Kir), which had been chosen by Alexander's Egyptian predecessors and which is exposed to waves from the N-E sector. These waves are less frequent than those from the W-N sector but are nevertheless very problematic in winter. Moreover, this site has a distinct tendency to silt up owing to its proximity to one of the main mouths of the Nile near Rosetta. Sediment carried down by the Nile is transported along the coast by waves from the N-E sector.

But what were these harbours actually used for?

Alexander was definitely not a sailor. He symbolically burnt his boats on disembarking in Asia after crossing the Hellespont with 300 triremes. He needed the assistance of 400 triremes from Sidon and Cyprus to conquer Tyre, and after founding Alexandria on 20 January 331 BC and remaining in Egypt for only a few months, he subsequently devoted his attention only to mainland countries. He therefore did not choose this site as a base for his fleet of warships, though his successors (in particular Ptolemy II Philadelphus) based their fleets there.

He must nevertheless have learnt the lesson from his master Aristotle, who 11 years earlier had advised him to create an access to the sea so as to be "easily supported on two fronts at once, from the land and from the sea" in the event of an enemy offensive, and also to "import products that are not found in your lands, and export your own surplus produce" (/2/, pp 9 and 11). The city is indeed located on a strip of land between the sea and lake Mariotis (the present lake Maryut), on which a river port was built. The river port is connected directly with the Nile and the Red Sea by means of a canal built by Ramses II and restored by Ptolemy II.

Three centuries later, at the time Strabo visited Alexandria (around 25 BC), the pirates had disappeared due to the efforts of Pompey's fleets a few decades earlier and trade was booming thanks to the peaceful conditions created by the Romans. Alexandria had almost a million inhabitants of various origins (/1/ p 261). It exported wheat to Rome and papyrus throughout the Mediterranean. It imported wood from Lebanon, wine, oil etc. (/1/ p 302). At the beginning of the Christian era, the city was exporting up to 150 000 t/year of wheat to Rome (/3/ p 297).

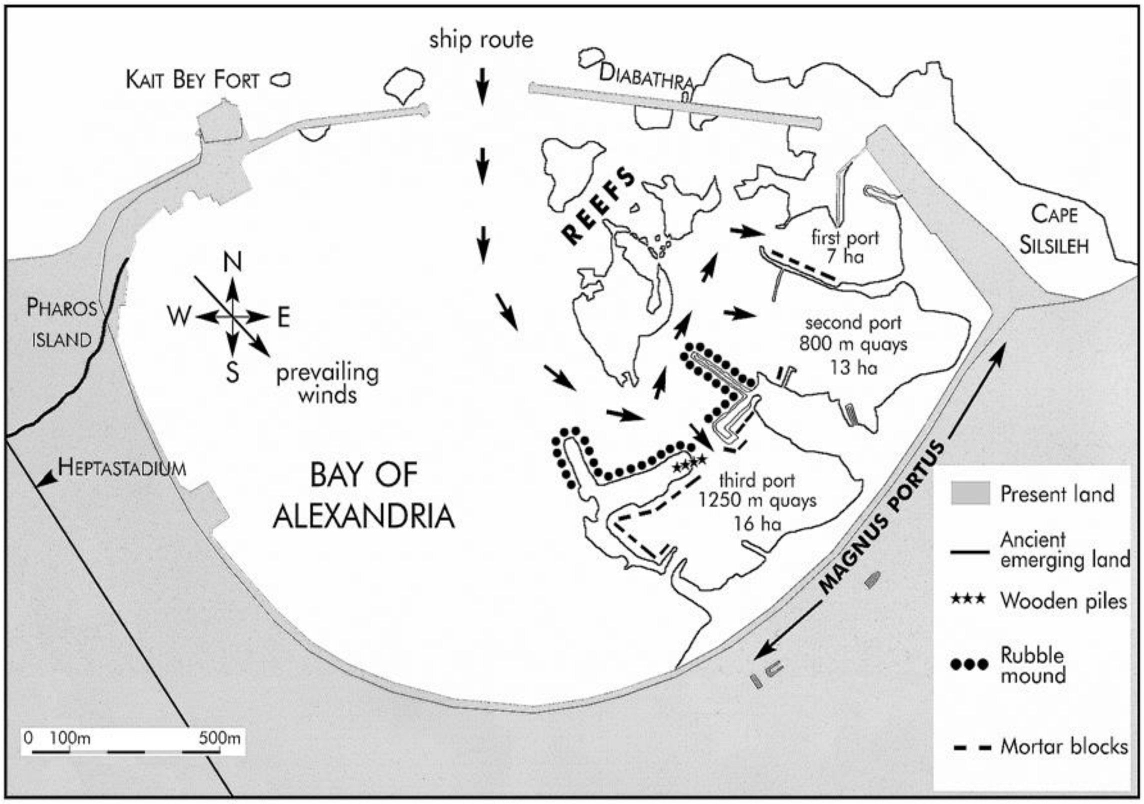
Alexandria had thus proved to be in a strategic position from the commercial point of view, as a land-sea interface.

OVERALL LAYOUT

Let us begin with what concerns all shipping, namely wind and waves. It may reasonably be assumed that the wind and wave conditions have hardly altered if at all since ancient times. Present statistics show that winds (and waves) prevailing off Alexandria come from the W-N sector (more than 50% of the time as an annual average and 70-90% of the time during the summer months from June to September). A second important sector is N-E (20-30% of the time during the winter months from October to May). This latter sector has had a considerable importance for the development of the port, as it is the reason for the double harbour arrangement, as pointed out above.

The first logical reaction would be to locate the port against the Heptastadium, in the shelter of Pharos Island, at the place where today's fishermen shelter their boats from prevailing winds from the W-N sector. Yet this argument does not appear to have carried weight as the three ports discovered to date are located at the opposite end, below Cape Lochias (modern Cape Silsileh), where the royal palace used to be, perhaps because they are located behind reefs that are as many traps for sailors who do not know them precidely. This eastern part of Alexandria Bay is relatively more exposed to offshore NW waves and this

meant that it was necessary to build a protective breakwater ("Diabathra") to supplement the natural protection offered by the reefs that emerged above sea level at the time.



Layout of Magnus Portus in the Bay of Alexandria

Another explanation of why the ports were located on the eastern side of Alexandria Bay could be the siltation that occurred against the Heptastadium and which dissuaded the Ptolemaic planners, who must have faced the same problem at Canopus. If it is assumed that the construction of the harbour began only during the reign of Ptolemy I Soter at the earliest (he acceded to the throne in 304 BC) then almost 25 years had elapsed since the construction of the Heptastadium. This is quite long enough to reveal siltation against the Heptastadium and incite the planners to locate the ports elsewhere.

Access to the ports could therefore only be achieved by skirting the reefs by the west and south. This meant that boats could enter the bay with the wind 3/4 astern before taking in the sail, and then be rowed NE to reach the entrance of one of the three ports.

In terms of the types of ship using the port, even though a few large commercial ships have been identified, the fleets of warships are better known.

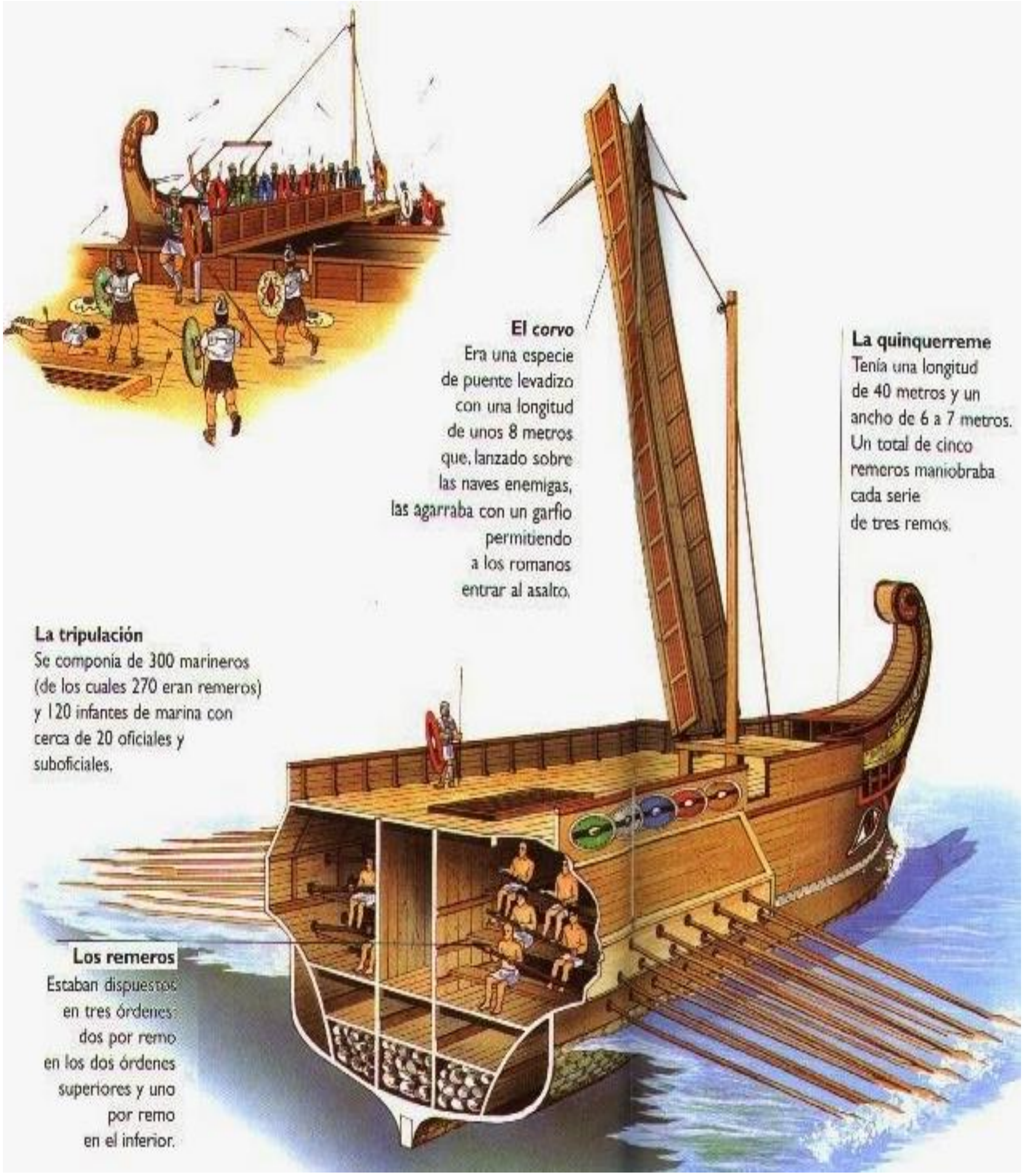
BC). The most productive was undoubtedly Ptolemy II, who, at his death in 246 BC, left a considerable fleet of warships (/4/ p 42):

- 2 "30 " s (i.e. 30 oarsmen on each side),
- 1 "20 " ,
- 4 "13 " s,
- 2 "12 " s,
- 14 "11 " s,• 67 "9 " s to "7 " s,
- 22 "6 " s & "5 " s (quinqueremes),
- 4 "3 " s (triremes),
- 150 to 200 "2 " s (biremes) and smaller.

making a total of around 10 large ships (from 50 x 10 m to 70 x 20 m), 80 medium ships (45 x 8.5 m) and 175 to 225 small ships (from 20 x 2.5 m to 35 x 5 m), totalling around 300 ships.

This number is of the same order of magnitude as others found at other periods. Pompey's fleet in his war against the pirates (in 67 and 66 BC) consisted of 200 quinqueremes and 30 triremes (/4/ p 82) and Antony's fleet at the battle of Actium consisted of 170 to 500 ships (the largest being a "10 "). It is also known that at other periods the Alexandrian fleet was smaller: the fleet burnt by Caesar at the battle of

Alexandria in 48 BC consisted of 50 quinqueremes and triremes, 22 other ships and 38 ships hauled up on land in the arsenals (/1/ p 311).



El *corvo*
Era una especie de puente levadizo con una longitud de unos 8 metros que, lanzado sobre las naves enemigas, las agarraba con un garfio permitiendo a los romanos entrar al asalto.

La quinquerreme
Tenía una longitud de 40 metros y un ancho de 6 a 7 metros. Un total de cinco remeros maniobraba cada serie de tres remos.

La tripulación
Se componía de 300 marineros (de los cuales 270 eran remeros) y 120 infantes de marina con cerca de 20 oficiales y suboficiales.

Los remeros
Estaban dispuestos en tres órdenes: dos por remo en los dos órdenes superiores y uno por remo en el inferior.

At the time the Romans and Carthaginians were battling with triremes and quinqueremes in the western Mediterranean (as at the battle of the Aegates in 241 BC), the Macedonians and Alexandrians were building giant galleys, the likes of which would never be seen again. In particular, it should be noted that these huge ships appeared at the time Ptolemy I was ascending the throne. They seem to have existed for several centuries, as Antony aligned a number of them opposite the Romans at the battle of Actium (31

As an exercise in defining the overall layout of the harbour, we attempted to find space in the discovered ports for all the ships of Ptolemy II's fleet. The areas of water in the ports are approximately as follows:

- first port: about 7 ha,
- second port: about 13 ha with probably around 800 m of quays,
- third port: about 16 ha with probably around 1250 m of quays,
- Heptastadium bay (between the third port and the island of Pharos): about 100 ha with 1000 to 2000 m of beach.

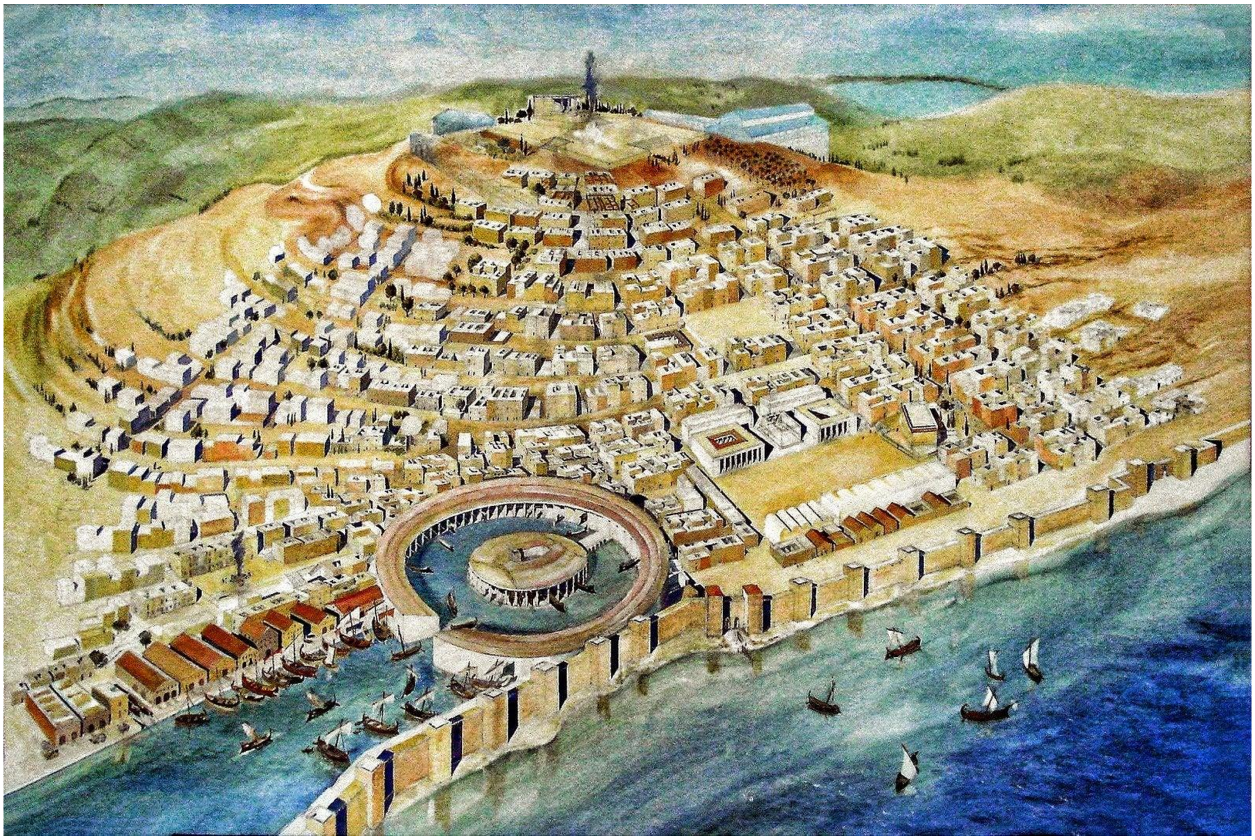
Carthaginians Naval warfare

The first port could comfortably accommodate the 10 large ships mentioned above. The 80 medium ships and 25 small ones could be aligned side by side, stern to quay, in the second port. The remaining 150-200 small ships could be sheltered in the third port, which has quay space for up to 250 quinqueremes.

It should also be noted that the beach in the bay, which was the site for the shipyards (/1/ p 283…) must have been covered with slipways for hauling vessels out of the water. Over a distance of 2000 m, it would be possible to accommodate about 200 quinqueremes under construction (with a distance of 5 m between them, which appears to be a minimum for proper working conditions). This number corresponds to the fleet that Pompey had built for his war against the pirates (/4/ p 82).

As regards commercial ships, the "2000 amphorae" and "10 000 amphorae" must have represented a cargo of the order of 100-500 t. An average ship of 250 t, i.e. 8 000 sacks weighing 31.5 kg each. To carry 500 000 t/year of wheat and other imported goods, with two return trips a year, a fleet of around 1000 of these ships would be required. These would sail during the fine season (from May to September) (/3/ p 270). However, it is likely that these ships called at the port of Eunostos rather than at Magnus Portus.

It is clear that Magnus Portus was among the largest ports of the time.



Carthage and its harbor 300 AD

HARBOUR STRUCTURES

Recent archaeological underwater investigations have revealed the existence of the three ports referred to above (/16/). The third port is the largest and uses the island of Antirrhodos as a natural protection against wave disturbance. The island was entirely developed as the site for a royal palace and quays consisting of large blocks of mortar cast in situ.

The remains of wooden structures have been used for carbon 14 dating and reveal the existence of an archaic structure in the form of a double row of piles.

One of the ironies of civilisation is that the ancient warship ports are quite similar to modern marinas in terms of the dimensions and the size of the ships using them (modern luxury yachts range in length from 15 to 70 m and more). However, the draught of the ancient galleys was less, of the order of 1 to 1.5 m. The largest ships (the “40”s of Ptolemy IV Philopator, or the Isis) must nevertheless have had a draught of up to 4 m.

The two principal types of harbour structure found in Alexandria are protective breakwaters and quays.

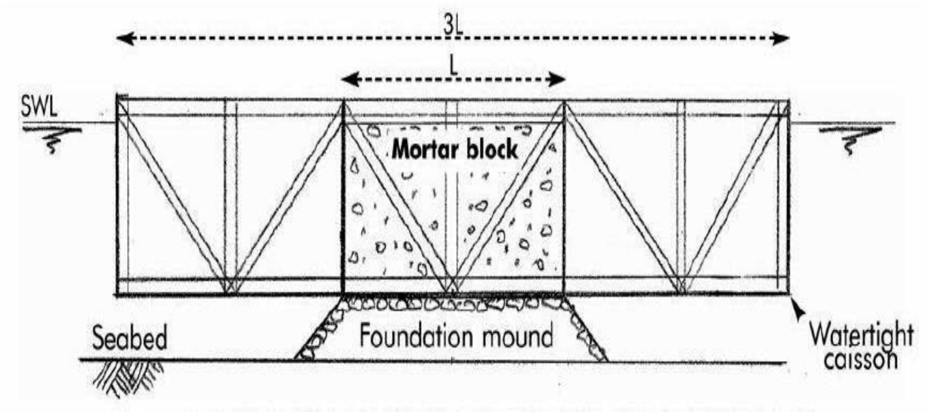
The breakwaters could be rubble mound or vertical-faced structures built of blocks. There is no point is dwelling on this question for Alexandria; the offshore breakwaters have not (yet) been explored, since they are probably located below the modern ones.

The inner breakwaters protecting each of the three ports consist of a sloping mound on the seaward side and in most cases a quay made of mortar blocks on the leeward side.

From a general point of view, quay structures may be classified as follows, depending on the material used:

- with timber: timber platforms on piles or pillars made of blocks of stone,
- without mortar: dressed stone blocks with a possible filling between two facings,
- with mortar, without pozzolana: massive blocks cast in the dry in wooden formworks,
- with mortar, with pozzolana: massive blocks cast under water in wooden formworks.

The early Alexandrians did not have the advantage of pozzolana when they first built Magnus Portus. It may therefore be assumed that each large block of concrete could have been built in the dry in a caisson that would be floated into position directly above the future quay, and ballasted until it sank to the bed on to a previously prepared foundation surface. The caisson must have been sufficiently watertight and buoyant in order to act as a barge capable of carrying the block of mortar (it should be recalled that the Egyptians had for centuries transported all kinds of dressed stones, columns and obelisks weighing up to several hundred tonnes by river).



Floating caisson for casting & transporting a mortar block

It would be enough for the caisson to be about 2.5-3 times larger than the mortar block (which has a relative density of about 2.5) as in this case, the draught of the caisson with its block would be about the same as the height of the block to be lowered into position. This explains the presence of timber beams and planks under the block, as well as the existence of vertical and inclined beams held in the mortar, giving the caisson its rigidity during the floating and sinking stages. This also explains the absence of vertical timber walls, as they must have been dismantled and recovered after the mortar block had descended to the bed.

However, the large mortar blocks discovered in the third port at Alexandria (/16/) (typically 5-8 m wide, 10-15 m long and 1-3 m high) do contain pozzolana and must therefore be of a later date (/18/). The block consists of alternating layers of mortar and flat pieces of limestone measuring about 0.1 x 0.1 m. The existence of planks of pine wood 3-4 cm thick under the block indicates that the form certainly consisted of a watertight floating caisson.

The double row of elm piles discovered at the eastern end of the island of Antirrhodos (/16/) is older than the large blocks mentioned above (around 400 BC). Moreover, it disappears under more recent fill material and large blocks. The presence of mortar at the lower end of the piles indicates that these rows must have been built in the dry, i.e. that they sank under the sea after construction.

The following hypothesis could be put forward, whereby this double row of piles could be the remains of an ancient timber quay.

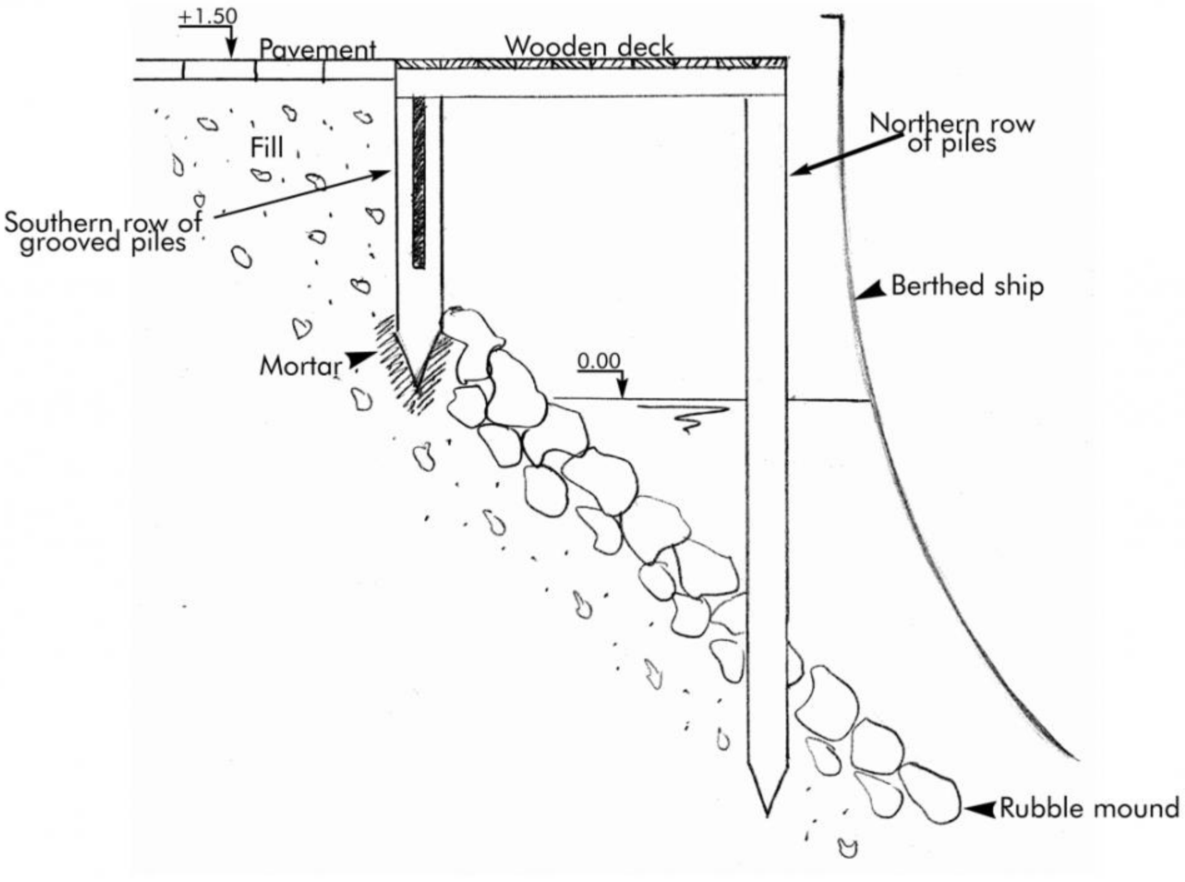


Figure 4 ARCHAIC QUAY MADE OF A WOODEN DECK RESTING ON PILES

The southern row consists of grooved piles (0.14 x 0.14 m section), spaced 0.4-0.5 m apart, into which pine planks 4 cm thick were introduced to form a small wooden curtain capable of holding quarry run fill. The northern row consists of simple piles spaced 0.2-0.4 m apart. These could have supported wooden planks and have been set in water about a metre deep. The northern row is 1.5-1.8 m from the southern row.

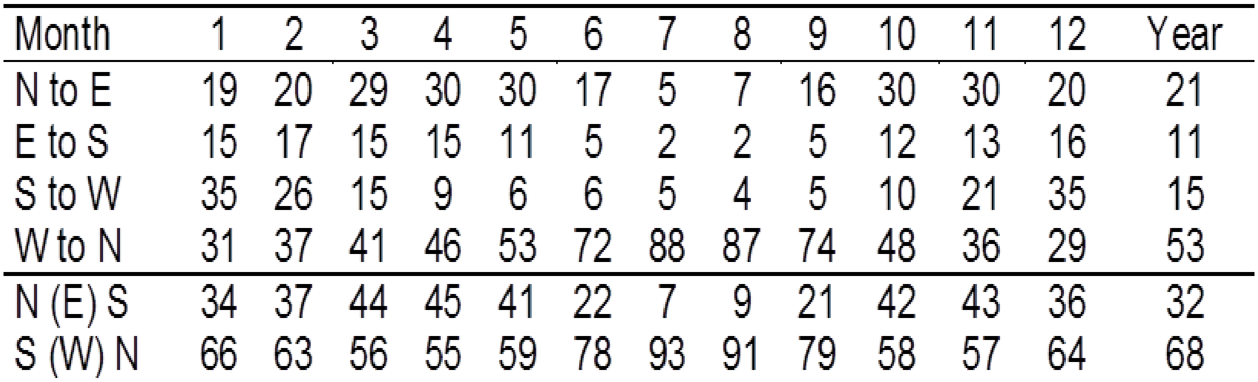
In **conclusion**, it is hoped that these investigations will be just the first in a long series, which will give us further information on ancient port engineering techniques.

It is to be hoped that this part of Alexandria Bay will soon be declared off limits for construction or, even better, transformed into an underwater museum.

OCEANOGRAPHIC CONDITIONS AT ALEXANDRIA

Winds

The following statistics were provided by Alexandria weather station for the period 1973-1992 (expressed as percentages of time per sector):



Month	1	2	3	4	5	6	7	8	9	10	11	12	Year
N to E	19	20	29	30	30	17	5	7	16	30	30	20	21
E to S	15	17	15	15	11	5	2	2	5	12	13	16	11
S to W	35	26	15	9	6	6	5	4	5	10	21	35	15
W to N	31	37	41	46	53	72	88	87	74	48	36	29	53
N (E) S	34	37	44	45	41	22	7	9	21	42	43	36	32
S (W) N	66	63	56	55	59	78	93	91	79	58	57	64	68

Alexandria wind statistics

The first four lines of the table give the frequency of occurrence of winds from the four 90° sectors. The last two lines give the figures for the two 180° sectors that might be referred to as “easterlies” for the N (E) S sector and “westerlies” for the S (W) N sector. The last column gives the annual average.

The following features may be noted:

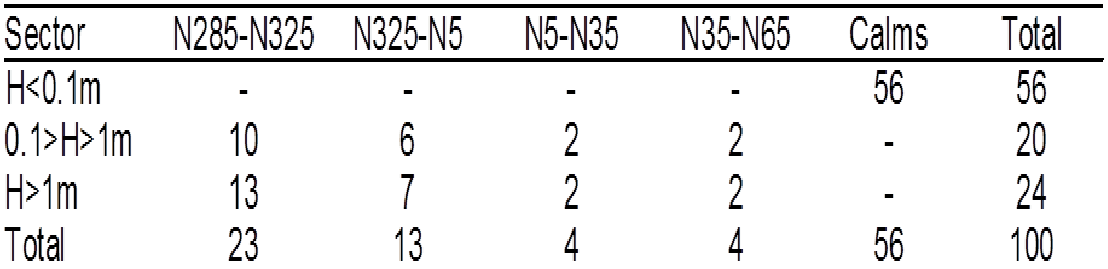
- as an annual average, westerlies blow for 2/3 of the time and easterlies for 1/3 of the time,
- as an annual average, winds blow from the W-N sector (“from NW”) for a little more than half of the time; these are therefore clearly the prevailing winds,
- winds in the summer (June-September) blow from NW for more than 3/4 of the time, and it is only during October and in winter up to May that there are between 35% and 45% of winds from the east.
- the famous “summer winds” in July and August are very clearly shown with over 90% of westerlies.

These figures explain why sailing from Rome to Alexandria was much easier than the reverse. The voyage took between 1 and 2 weeks in the first direction and at least double in the opposite direction. Ships made an average of 2 voyages per year during the fine season from May to September in order to avoid storms (/3/ p 270 and 297).

See also design waves for coastal structures on the Mediterranean coasts.

Waves

The following statistics were obtained from observations made on board selected ships in the eastern Mediterranean during the period 1960-1980:



Sector	N285-N325	N325-N5	N5-N35	N35-N65	Calms	Total
H<0.1m	-	-	-	-	56	56
0.1>H>1m	10	6	2	2	-	20
H>1m	13	7	2	2	-	24
Total	23	13	4	4	56	100

Alexandria wave statistics

The first four columns indicate the frequencies of occurrence of offshore waves in percentages of time for the sectors shown. The fifth column gives the percentage of calms (and other sectors that cannot reach Alexandria). The first line shows calms. The second line shows waves below 1 m and the third line those above 1 m (crest-trough height).

The following features may be noted:

- the sea is calm off the coasts of Egypt and Libya for just over half the time,
- waves of more than 1 m, which are problematic for sailing ships, occur for about a quarter of the time,
- waves from the W-N sector (approximately N285 to N5) represent 36% of the time and those from the N-E (approximately N5 to N65) only 8%.

See also design waves for coastal structures on the Mediterranean coasts.

Sea levels

The following levels have been adopted by the Egyptian authorities (with respect to the land datum):

- LLWL (Lowest Low Water Level): -0.43 m
- CD (Chart Datum or hydrographic zero): -0.34 m
- MLWL (Mean Low Water Level): -0.05 m
- MSL (Mean Sea Level): +0.08 m
- MHWL (Mean High Water Level): +0.21 m
- HHWL (Highest High Water Level): +0.74 m

It should be noted that the LLWL is 9 cm below the hydrographic zero and the mean sea level at Alexandria is 8 cm above the Egyptian land datum.

It should be pointed out that mean sea levels have changed over the last 2500 years. Without entering into expert discussions on this subject, it may be estimated that the sea level rise during the period has been about 0.50 m (/20/), i.e. about 2 cm/century. It may be added that the present rate of rise is much greater as it has reached about 18 cm during the past century (1880-1980)(/19/) and it is currently estimated that it will be between 50 and 100 cm in the 21st century.

Oscillations in mean sea level nevertheless seem to have occurred over the past two millennia. It is also very difficult to distinguish eustatic movements (those connected with the sea) from tectonic movements (connected with the land). The example of Crete is a good illustration. Over the past 2000 years the sea level has dropped by 4 to 8 m with respect to the land at the western end of the island, whereas at the eastern end it has risen by 1 to 4 m during the same period (/20/, p 68).

It is currently admitted that the sea level at Alexandria has risen by 0.5 m and the land level has fallen by 5 to 6 m over the past 2000 years.

It should also be noted that tsunamis have been mentioned on the coasts of the Near East /18/ .

Sedimentology

The sediments found on the beaches and sea bed near Alexandria Bay consist of sand with a grain size (D_{50}) ranging from 0.20 to 0.50 mm. This sand consists of ancient deposits carried down by the Nile. For the past few decades the beaches at Alexandria have been suffering from widespread erosion and protective measures have been taken (involving beach nourishment or rockfill structures) with varying degrees of success. This erosion is due mainly to beach sand being carried offshore during storms.

In addition to the offshore transit of sand, there is significant longshore drift to both the east and west. Specialists estimate that the sand transport in each direction amounts to around 100 000 m^3/year, and thus cancels out. It is clear that if an obstacle were to be built perpendicular to the coast, sand would be deposited on either side. This is what must have happened after the construction of the Heptastadium, where at least some of this longshore drift must have been trapped each year.[3]

REFERENCES

1. *Alexandria, Egypt, before Alexander the Great: A multidisciplinary approach yields rich discoveries , Jean-Daniel Stanley, Geoarchaeology Program, Paleobiology, Smithsonian Institution National Museum of Natural History (NMNH), Washington, D.C. USA;* https://www.geosociety.org/gsatoday/archive/17/8/pdf/i1052-5173-17-8-4.pdf
2. *Ancient Ports - Ports Antiques, The catalogue of Ancient Ports,Alexandria Magnus Portus*,http://www.ancientportsantiques.com/a-few-ports/alexandria/
3. *Port Engineering aspects of the Magnus Portus in Alexandria, Arthur de Graauw,2000 https://www.researchgate.net/publication/315911118_Port_Engineering_aspects_of_the_Magnus_Portus_in_Alexandria*

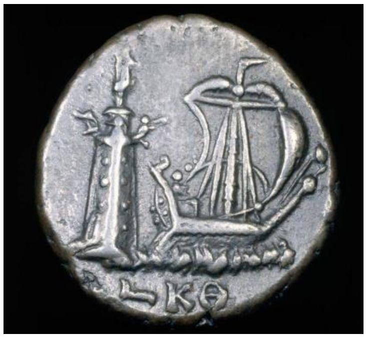
CHAPTER V

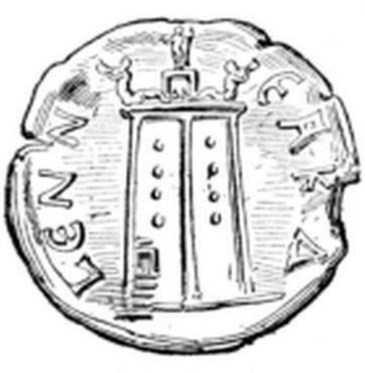
Fall of the Tower

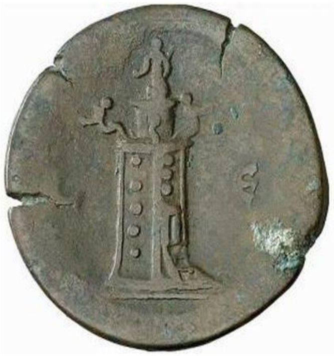
Representation of the lighthouse: Of the seven wonders of the ancient world, the lighthouse of Alexandria is probably the one with the most written traces - except for the pyramid of Cheops, of course. But in Alexandria, his memory is even more vivid. The city has a logo that represents it, of course, as well as the University of the city.

Such modern representations are interesting because they show the attachment of the Alexandrians to their heritage, even disappeared, but nothing will be worth the interest of the representations of time on various supports, in the course of time. And first of all, representations which were made during the life of the monument, that is to say between the third century BC and 1303, for even if after that date it was still there, it was ruined and no had then no more interest, waiting only to be dismantled definitively..

IIe siècle





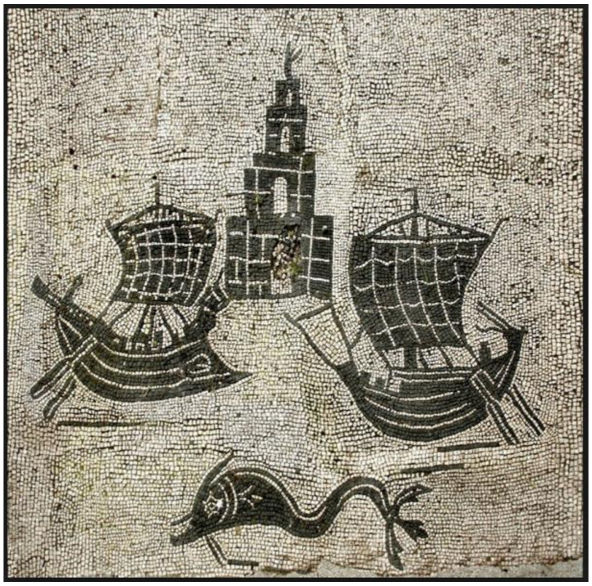


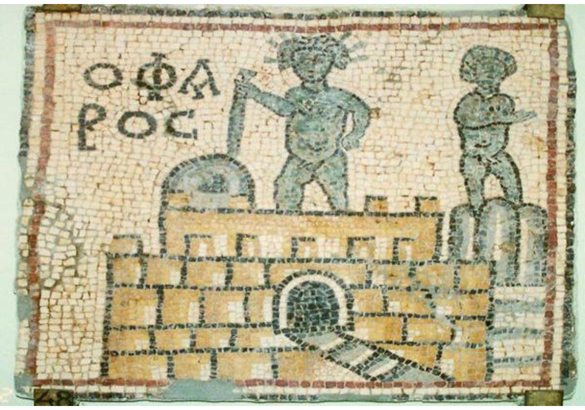
Left: A coin dating from the Emperor Commodus (180-192). It represents the lighthouse of Alexandria and a boat passing nearby. (Bibliothèque nationale de France, Department of Mint)

In the center: A coin dating from Emperor Antonin (138-161). It represents the lighthouse of Alexandria (Private collection)

Right: A coin dating from Emperor Hadrian (117-138). It represents the lighthouse of Alexandria (Private collection)

These pieces are presented from the most recent to the oldest. They are part of the oldest representations of the lighthouse of Alexandria and although the image is not precise, we guess the general form. Two of these pieces, struck 400 years after the construction of the lighthouse, emphasize the statues of the peaks.



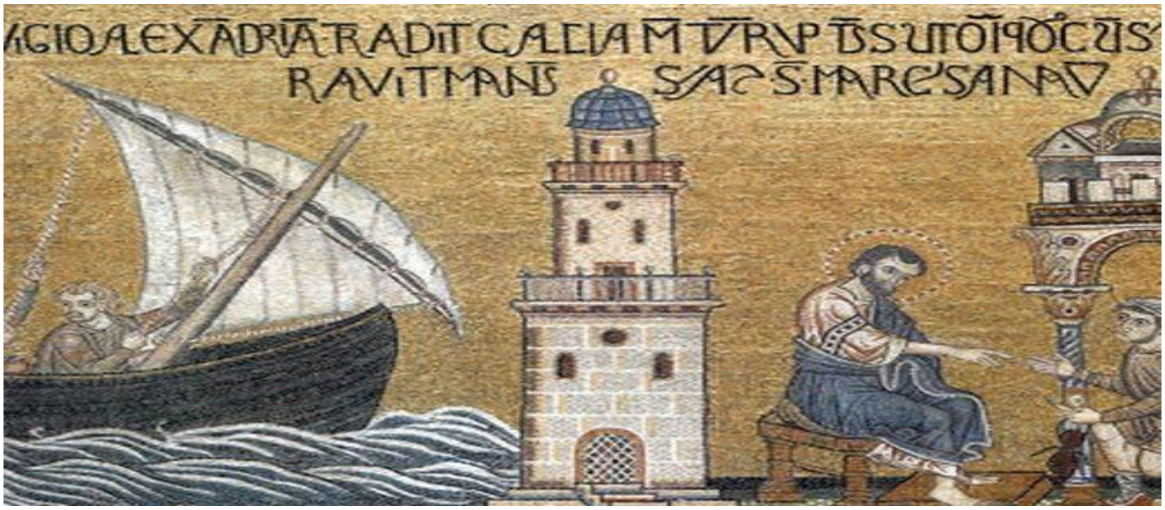


VI^{e} century

alamy stock photo

This mosaic dates from 539 AD to the Museum of Qsar, in Libya. It represents the lighthouse of Alexandria with the statue of Zeus at its summit. It can be confused with Helios since it carries a belt of solar rays around the head, as does the God of the Sun (a symbol taken from the Statue of Liberty centuries later.

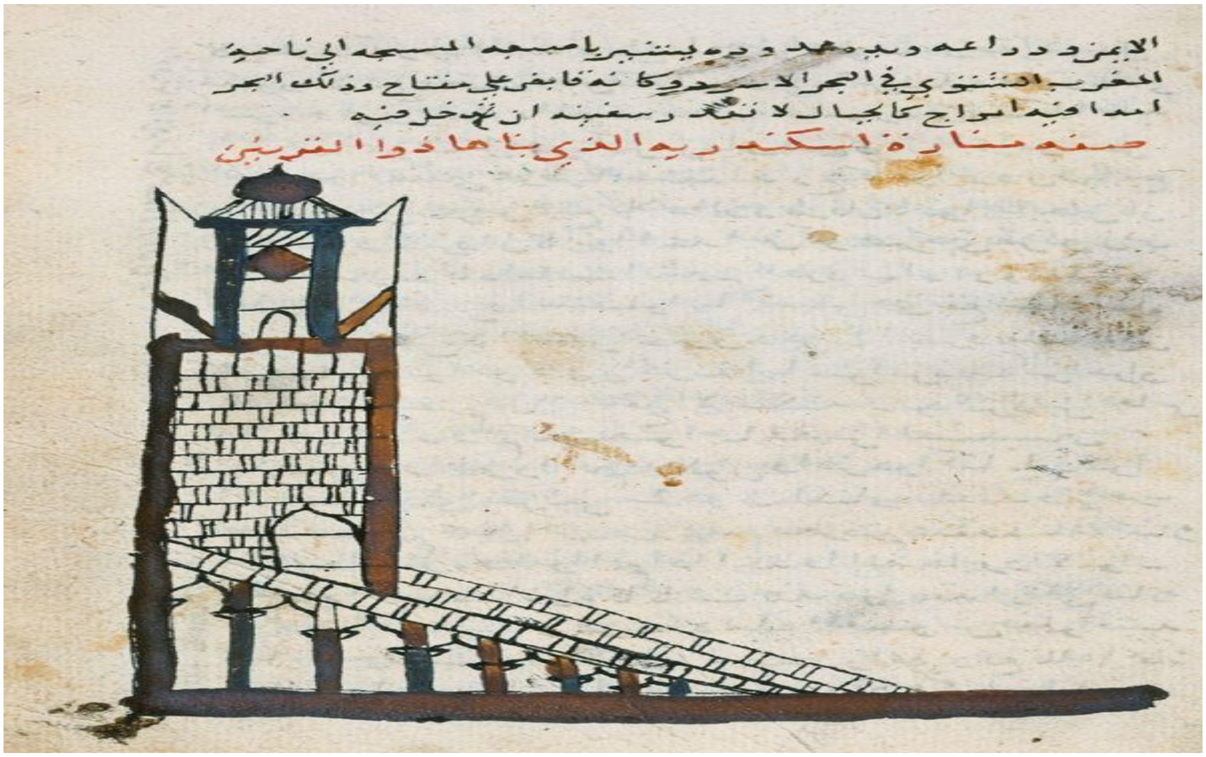
XII^{e} century



One of the last representations of the lighthouse before its destruction is in Venice, on a mosaic of the Basilica of St. Mark. Finding it is not so simple so this basilica is rich mosaic issue. This representation is therefore fairly faithful. Even if the difference between the square part and the cylindrical part is not distinguished on such work, it seems that the proportions are correct. There is a beginning of ramp access, and each floor is protected by a sort of backstay. The summit conforms to past descriptions but it does not remind the presence of a statue at its summit. Also it seems that the windows are not properly arranged, the lighthouse seemingly had windows in ququito.

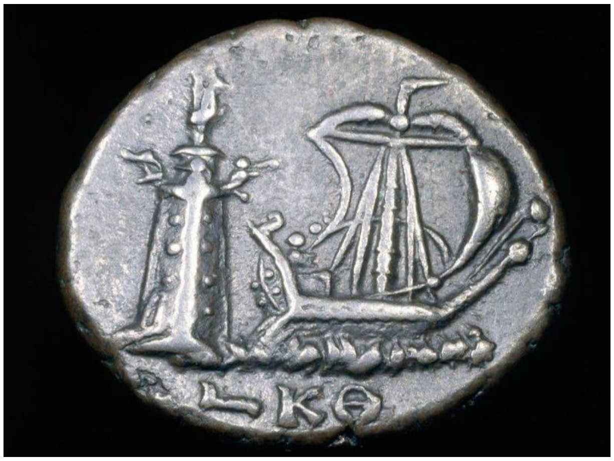
The representations subsequent to 1303 lack credibility because they were made from memories (for the most reliable) or are purely imaginary (in the worst case). Between the two there was room for some images that were based on information not totally false.

XVI^{e} century

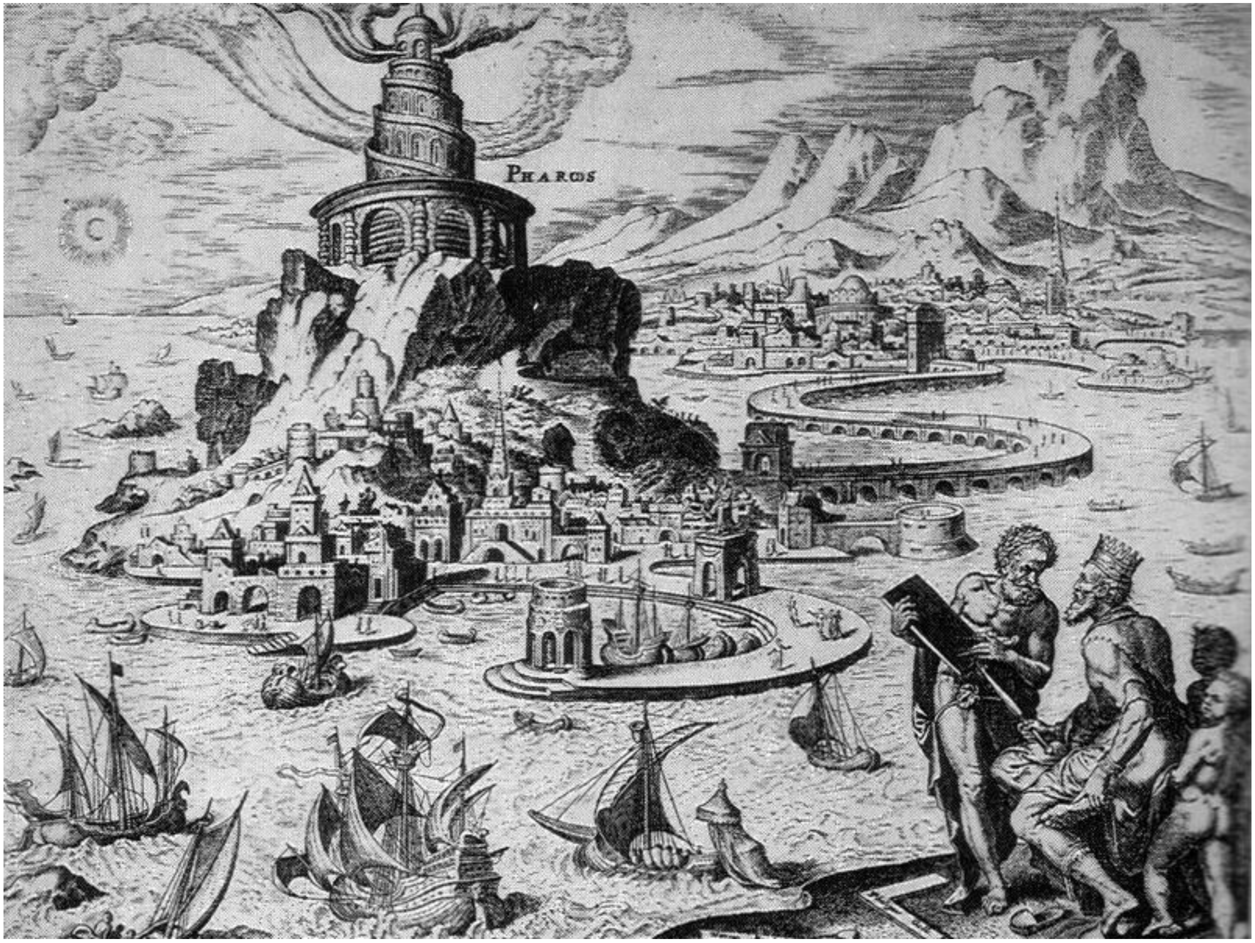

صفه منارة اسكندريه الذي بناها ذوا القرنين

This drawing dates from the 16th century, it was realized by Muhammad al-Qaysi al-Gharnatî. It is currently in a book kept at the Bibliothèque Nationale de France. This is a very simple drawing that does not compete with those made at the same time by Western artists. This one has the merit of existing, it shows a lighthouse without the octagonal central part and emphasizes the ramp of access.The representations subsequent to 1303 lack credibility because they were made from memories (for the most

reliable) or are purely imaginary (in the worst case). Between the two there was room for some images that were based on information not totally false.



A coin dating from the Emperor Commodus (180-192). It represents the lighthouse of Alexandria and a boat passing nearby. (Bibliothèque nationale de France, Department of Mint)



Maarten van Heemskerck ***was a portraitist and historical painter of the course of the Netherlands. One of these works consisted in drawing the seven wonders of the world, of which the reproduction of the lighthouse of Alexandria is given here.***

It shows a colossal work, but above all a work of fiction because this representation is probably the furthest from what could have been drawn from all time. The headlight, cylindrical and low, has a strange helical ramp. It is on an island built and with a winding road in the sea, whereas reality, on this not so distant point, would have shown a straight road. The background is covered with mountains whereas there are none in Alexandria. Without the mention "Pharos" one could have a doubt about what this monument, in the first surroundings.

XVIII^e century

This image, well known in the archeology world of the lighthouse of Alexandria, is a pure invention based on real elements. But one in the other, it is very far from the truth, with a tower with 4 levels instead of 3, a circular ramparts and curious decorations on the walls that reality ignores. The very form of the island is a heresy, the island of Pharos being rather long whereas this representation designates it as circular.

His author is Johann Bernhard Fischer von Erlach, he was an architect and sculptor. Austrian notionality (Graz, July 20, 1656 - Vienna, April 5, 1723, is the origin of the Austrian late Baroque architectural style, which is confirmed in this drawing where one can feel the influence of the baroque.

The lighthouse as a model

The lighthouse of Alexandria has always been a model for maritime activity around the Mediterranean. It can be found in several similar forms in various countries such as Egypt, Libya, Algeria, but also in France, Italy, Spain and even in Great Britain where the shape of the Dover lighthouse, built at the Roman period, was inspired by that of Alexandria.

Most of these lighthouses have disappeared nowadays, and those that are still in place are either still in use, and in this case they have been modernized to the point where they no longer find antique or abandoned, and in this case the remains are sometimes in good condition, but most of the time they are strongly overhauled over time.

PREHISTORIC HARBOUR.

For details of this important and mysterious work see “Les Ports submergés de l’ancienne Isle de Pharos” by M. Jondet, the discoverer.

Possibly it may be the harbour alluded to in the Odyssey but no historian mentions it. Theosophists, with more zeal than probability, have annexed it to the vanished civilisation of Atlantis; M. Jondet inclines to the theory that it may be Minoan—built by the maritime power of Crete. If Egyptian in origin, perhaps the work of Rameses II (B.C. 1300); statues of his reign have been found on Rhakotis (p. 7), and we know that he was attacked by "peoples of the West," and built defences against them. It cannot be as late as Alexander the Great or we should have records. It is the oldest work in the district and also the most romantic, for to its antiquity is added the mystery of the sea.

Long and narrow, the Harbour stretched from the rock of Abou Bakr on the west to an eastern barrier that touched the shore beyond the Tour de la Mission d'Egypt. These two points are joined up by a series of breakwaters on the north. The entrance was from an unexpected direction, the south. Having rounded Abou Bakr, ships turned north under the Ras-el-Tin promontory, where there is deep water. To their left were solid quays, stretching to Abou Bakr, and recently utilised in the foundation of the modern breakwater. To their right was another quay. Having entered, they were well in the middle of the main harbour, with a subsidiary harbour to the north.

FORT KAIT BEY (THE "PHAROS").

This battered and neglected little peninsula is perhaps the most interesting spot in Alexandria, for here, rising to an incredible height, once stood the Pharos Lighthouse, the wonder of the world. Contrary to general belief, some fragments of the Pharos still remain. But before visiting them and the Arab fort in which they are imbedded, some knowledge of history is desirable. The fortunes of the peninsula were complicated, and the labours of scholars have only lately made them clear.

(1). History of THE ORIGINAL BUILDING.

The lighthouse took its name from Pharos Island (hence the French "phare" and the Italian "faro"). No doubt it entered into Alexander the Great's scheme for his maritime capital, but the work was not done till the reign of Ptolemy Philadelphus. Probable date of dedication: B.C. 279, when the king held a festival to commemorate his parents. Architect: Sostratus, an Asiatic Greek. The sensation it caused was tremendous. It appealed both to the sense of beauty and to the taste for science—an appeal typical of the age. Poets and engineers combined to praise it. Just as the Parthenon had been identified with Athens and St. Peter's was to be identified with Rome, so, to the imagination of contemporaries, the Pharos became Alexandria and Alexandria became the Pharos. Never, in the history of architecture, has a secular building been thus worshipped and taken on a spiritual life of its own. It beaconed to the imagination, not only to ships at sea, and long after its light was extinguished memories of it glowed in the minds of men.

It stood in a colonnaded court.. There were four stories. The square bottom storey was pierced with many windows and contained the rooms, estimated at 300, where the mechanics and attendants were housed.

There was a spiral ascent—probably a double spiral—and in the centre there may have been hydraulic machinery for raising fuel to the top; otherwise we must imagine a procession of donkeys who cease not night and day to go up and down the spirals with loads of wood on their backs. The storey ended in a square platform and a cornice and figures of Tritons. Here too, in great letters of lead, was the Greek inscription; "Sostratus of Cnidos, son of Dexiphanes: to the Saviour Gods: for sailors"—an inscription which, despite its simplicity, bore a double meaning. The "Saviour Gods" are of course Castor and Pollux who protect mariners, but a courtly observer could refer them to Ptolemy Soter and Berenice, whose worship their son was promoting.

KAIT BEY PLAN II

The second storey was octagonal and entirely filled by the spiral ascent. Above that was the circular third story, and above that the lantern. The lighting arrangements are uncertain. Visitors speak of a mysterious "mirror" on the summit, which was even more wonderful than the building itself. What was this "mirror"? Was it a polished steel reflector for the fire at night or for heliography by day? Some accounts describe it as made of finely wrought glass or transparent stone, and declare that a man sitting under it could see ships at sea that were invisible to the naked eye. A telescope? Is it possible that the great Alexandrian school of mathematics discovered the lens, and that their discovery was lost and forgotten when the Pharos fell? It is possible. It is certain that the lighthouse was fitted with every scientific improvement known to the age, that the antique world never surpassed it, and that the mediaeval world regarded it as the work of Jinns.

Standing on the lantern was a statue of Poseidon. This terminated the tower, whose complete height certainly exceeded 400 feet and possibly touched 500.

(2) HISTORY OF THE BUILDING.

We must now follow this masterpiece of engineering into ages of myth and oblivion. It retained its form and functions unimpaired up to the Arab Conquest (A.D. 641). The first, and irreparable, disaster was the fall of the lantern (about 700), entailing the loss of scientific apparatus that could not be replaced. There is a legend that the disaster was planned by the Byzantine Emperor, who could not attack Egypt owing to the magic "Mirror," which detected or destroyed his ships. He sent an agent who gained the Caliph's confidence and told him that beneath the Pharos the treasure of Alexander the Great lay buried. The Caliph commenced demolition, and before the inhabitants of Alexandria, who knew better, could intervene, the two upper stories had fallen into the sea. Henceforth the Pharos is only a stump with a bonfire on the top.

There were restorations under Ibn Touloun (880), and also about 980, but they were unsubstantial additions to the Octagon which the wind could blow away. Structural repairs were neglected, and about 1100 the second disaster occurred—the fall of the Octagon itself through an earthquake. The square bottom story survived, but only as a watchtower on the top of which was run up a small square Mosque. which illustrates this state of the Pharos. The level of the ground has risen owing to the debris from the octagon, and the lower story has been buttressed). Then came the final earthquake (14th cent.) and the slow dissolution was over.

Though unable to preserve the Pharos the Arabs admired it, and speak, with their love of the marvellous, of a statue on it whose finger followed the diurnal course of the sun, of a second statue who gave out with varying and melodious voices the various hours of the day, and of a third who shouted an alarm as soon as a hostile flotilla set sail,. The first two statues may have existed; the Alexandrians loved such toys. And there is an element of truth in another Arab legend—that the building rested upon a "glass crab." Some vitrious composition probably did form the foundation, and we know that "Cleopatra's Needle" actually did rest on crabs of metal; the oriental mind has confused the two monuments. The legend culminates in the visit to the Pharos of a cavalcade of horsemen who lose their way in the 300 rooms, and inadvertently riding into a crack in the glass crab's back fall into the sea! But sometimes the lighthouse sheltered pleasanter adventures. The poet El Deraoui, for example, writes:

A lofty platform guides the voyager by night, guides
him with its light when the darkness of evening falls.
Thither have I borne a garment of perfect pleasure
among my friends, a garment adorned with the memory of
beloved companions.
On its height a dome enshadowed me, and thence I saw
my friends like stars.
I thought that the sea below me was a cloud, and that
I had set up my tent in the midst of the heavens.

Moreover "El Manarah," as the Arabs called it, gave the name to, and became the model for, the "minaret." There is no minaret in Alexandria that closely follows the Pharos, but at Cairo (e.g. at the Tombs of the Mamelukes) one can still see the square bottom story, the Octagon, the Round and the Summit that exactly reproduce the four-stage design of Sostratus.

(3). FORT KAIT BEY.

For a hundred years ruins cumbered the peninsula. Then (1480) the Mameluke Sultan Kait Bey fortified it as part of his coast defence against the Turks, who had taken Constantinople and were threatening Egypt. (p. 81). Kait Bey is a great figure at Cairo, where mosques commemorate his glorious reign. Here he only builds a fort, but like all his work it is architecturally fine, and even in decay its outlines are harmonious. The scheme was a pentagon (Plan II) and in the enclosed area, on the exact site of the Pharos, stood a square castle or keep with a mosque embedded in it., which shows the castle before it was ruined, the minaret sticking up inside it). The Turks effected their conquest in 1517, and when their power in its turn declined, Mohammed Ali (1805-1848) modernised the defences. No visitors were admitted, and the Fort gained the reputation of an impregnable and mysterious place. Its career ended with the English bombardment of 1882. Though it did not suffer as much as its neighbour Fort Adda, damage enough was done. The castle was shattered, the minaret snapped, and the desolation and squalor re-established that brood there to-day.

The time of construction

And that's where the lighthouse begins. Let us go back a little before, in 331 BC. It was in that year that Alexander the Great founded a city that bears his name. He had conquered an Empire on horseback over the West and the East, and undoubtedly wanted to mark his power. The new city of Alexandria is now Egypt, along the coast, north of a protective lake and facing an island connected to the mainland by an artificial pontoon. At the death of Alexander his empire was divided between his generals, the provinces were then administered by satraps, what we would now call "governors." The satrap of Egypt, a certain Ptolemy, took possession of the province and founded a new dynasty, the Ptolemaic dynasty, which reigned over Egypt a few decades. He then launched at Alexandria the construction of an imposing lighthouse, at the same time emblem of the kingdom and tools of navigation, the aim of which was both to guide the sailors in the dangerous waters of the coast and to impress travelers.

In 297 the work began, it was under Ptolemy I Ster, the name that history has attributed to him. The work was very rapid, lasted only 15 years and ended in 283 BC, during the reign of his son Ptolemy II.

The first millennium

Between 45 and 35 BC the lighthouse was repaired, it had been seriously damaged during a war between the Emperor Caesar and the partisans of Pompey. We were under the orders of Cleopatra.

Then comes the time of degradation. The first millennium teaches us very little about the use of the lighthouse. Some witnesses report that it was operating normally, in spite of the time that passes. In 796 a violent earthquake caused the top of the lighthouse to collapse, the whole cylindrical part. It will never be rebuilt.

A seat later Egypt was colonized by the Arabs who imported into Egypt the Muslim religion. between 873 and 783 the sultan of Egypt had a mosque built at the top of the lighthouse, giving it the title of the highest mosque in the world. This mosque was covered by a dome as is often seen in the representations of such buildings.

The period of earthquakes

In 956 the upper part of the lighthouse fell as a result of violent earthquakes which seriously shook Alexandria. In 1261 much of the lighthouse collapsed, always following seismic shocks. It was largely ruined and could no longer be repaired, especially since the façade itself fell in 1323 (Other dates indicate that the main earthquake took place in 1303). Finally a new earthquake definitively drops the last sections still standing in 1375.

The lighthouse of Alexandria is now only a heap of stones on the island of Pharos. The Sultan Qaitbayording that a fort be built on this island, destined to protect the port, the loose stones received a new assignment, and they were used to build Fort Qaitbay. Nowadays the fort is still in place, so visiting it is a bit like visiting the lighthouse of Alexandria ...

The lighthouse was partially cracked and damaged by earthquakes in 796 and 951, followed by structural collapse in the earthquake of 956, and then again in 1303 and 1323. Damaging earthquakes propagate from two well known tectonic boundaries, the African-Arabian and Red-Sea rift zones, respectively 350 and 520 km from the lighthouses location. Documentation shows the 956 earthquake to be the first to cause structural collapse of the top 20+ metres of the construction. Documented repairs after the 956 earthquake include the installment of an Islamic style dome after the collapse of the statue that previously topped the monument. The most destructive earthquake in 1303 was an estimated intensity of VIII+ originating from the Greek island of Crete (280–350 km from Alexandria).[16] Finally, the stubby remnant disappeared in 1480, when the then-Sultan of Egypt, Qaitbay, built a medieval fort on the larger platform of the lighthouse site using some of the fallen stone.

The 10th-century writer al-Mas'udi reports a legendary tale on the lighthouse's destruction, according to which at the time of Caliph Abd al-Malik ibn Marwan (r. 705–715) the Byzantines sent a eunuch agent, who adopted Islam, gained the Caliph's confidence, and secured permission to search for hidden treasure at the base of the lighthouse. The search was cunningly made in such a manner that the foundations were undermined, and the Pharos collapsed. The agent managed to escape in a ship waiting for him.

Evolution of the lighthouse in time, its degradation

It is difficult to follow the lighthouse in time, because the testimonies of this period are missing. It is known that the Emperor Anastasius I (491-518) had renovations of the submerged subsoil to a certain Ammonios. In 670 the French bishop Aroulfe explains in a document the role of the tower of Pharus, its operation, and the reason why it is important to enter safely in the port. He takes the opportunity to point out that the island is surrounded by pious massifs intended to support the banks.

The lighthouse of Alexandria, built at one time, has obviously not undergone any major changes during its existence. In fact, the modifications were essentially natural. It was an earthquake that destroyed the third floor of the lighthouse during the tenth century. Lying on the ground, the summit was never rebuilt. In his place the sultan Ahmed Ibn Tulun, who ruled the city, had an oratory built, giving the lighthouse a mosque role (and in the process, it was the highest mosque in the world). If you observe the minaret that this sultan built in Cairo, you will find that it follows the same architectural form as the lighthouse of Alexandria: Square at the bottom, octagonal at the center and cylindrical at the top.

In 1303 a second earthquake struck him again, more violently. If one believes a writing preserved in Montpellier (Cartular of Montpellier), the exact date of the shake is the 8 of August.

In the year 1303, on the 8th of August, there was a great earthquake in Alexandria, which caused the lighthouse to fall, and the third part of the town to fall.
But the destruction does not seem to have been complete since Ibn Battuta was still able to describe the lighthouse in April 1349.

Having gone to the Lighthouse on my return from the Maghrib in the year 750, I observed that its state of disrepair was such that it was no longer possible to enter it, nor to reach the door giving access to it.
It was only at the end of the 15th century that the lighthouse of Alexandria, or rather what remained of it, was completely dismantled. The stones were then used for the construction of Fort Qaitbay, which guards the entrance of the port of the city still today.

If there are not enough texts explaining how the lighthouse was built and how it went through the centuries, we still have some information thanks to interesting testimonials.

As stated above In 670 the French bishop Aroulfe made a description of the site, it is very old. In 870 it was an official in Egypt, a Bagdadi, who made another similar description. The lighthouse was then always used daily.

Ali al-Mas'udi, who was born in Baghdad and died in Cairo around 956, was an Arab historian and geographer. Witness to the slow disappearance of Alexandria due to the various seismic shocks as well as to the subsidence of ground, it describes precisely the damages caused. His narrative gives details of the state of the lighthouse, which is already partly in ruins.

The testimony of Abu al-Haggag Yusuf Ibn Muhammad al-Balawi al-Andalusi is interesting because it dates from the twelfth century, so it is done shortly before the severe destruction of the lighthouse (1303) and sufficiently late to be us without too much deformation. He describes the access ramp, the high door, the general shape of the lighthouse. In the fourteenth century it was Ibn Battuta who took up a similar description, two centuries later.

Permanent disappearance of the lighthouse

Why did the lighthouse of Alexandria disappear? In fact it's quite simple, it has undergone two events. First of all it was abandoned and without maintenance, it is found in the 10th century heavily degraded after an earthquake dropped the 3rd floor. He could no longer serve at that time, and it was a long time ago that he was no longer serving. The lighthouse could have been repaired and consolidated but the Arab civilization of the early Muslim times did not have the magnitude of the previous civilization, so it was impossible for them to correct it. This period lasted until the end of the fifteenth century, when it was so degraded that it was demolished. The stones were recovered and used for the construction of the Qaitbay which guards the entrance of the port of the city still today. So it was at the end of the 15th century that we lost all hope of reviving the lighthouse of Alexandria.

In the port of Alexandria there are vestiges of the lighthouse, the stones that had been damaged in the sea without being able to easily ascend them. Diverse archaeologists work regularly on this site.

Underwater archeology

Excavation

For a long time it has been known that vestiges of the lighthouse must be immersed at the bottom of the port of Alexandria, but it was not until the modern period that we thought of making real archaeological explorations.

The first underwater excavations took place in 1968, but they were quickly stopped. They resumed between 1992 and 1998 under the responsibility of a Frenchman, Jean-Yves Empereur, and through the Center d'Etudes Alexandrines. These explorations made it possible to identify many submerged blocks as well as various statues that were brought up to the surface, in particular a Ptolemy I in Pharaoh and Isis. Built in Alexandria, a recent city at the time of its construction, the lighthouse of Alexandria has an aura that goes well beyond Egypt. It must be said that between its listing of the 7 wonders of the world and the archaeological excavations that took place at sea recently, there is enough to write about this monument of Antiquity.

In 1968, the lighthouse was rediscovered. UNESCO sponsored an expedition to send a team of marine archaeologists, led by Honor Frost, to the site. She confirmed the existence of ruins representing part of the lighthouse. Due to the lack of specialized archaeologists and the area becoming a military zone, exploration was put on hold.[18]

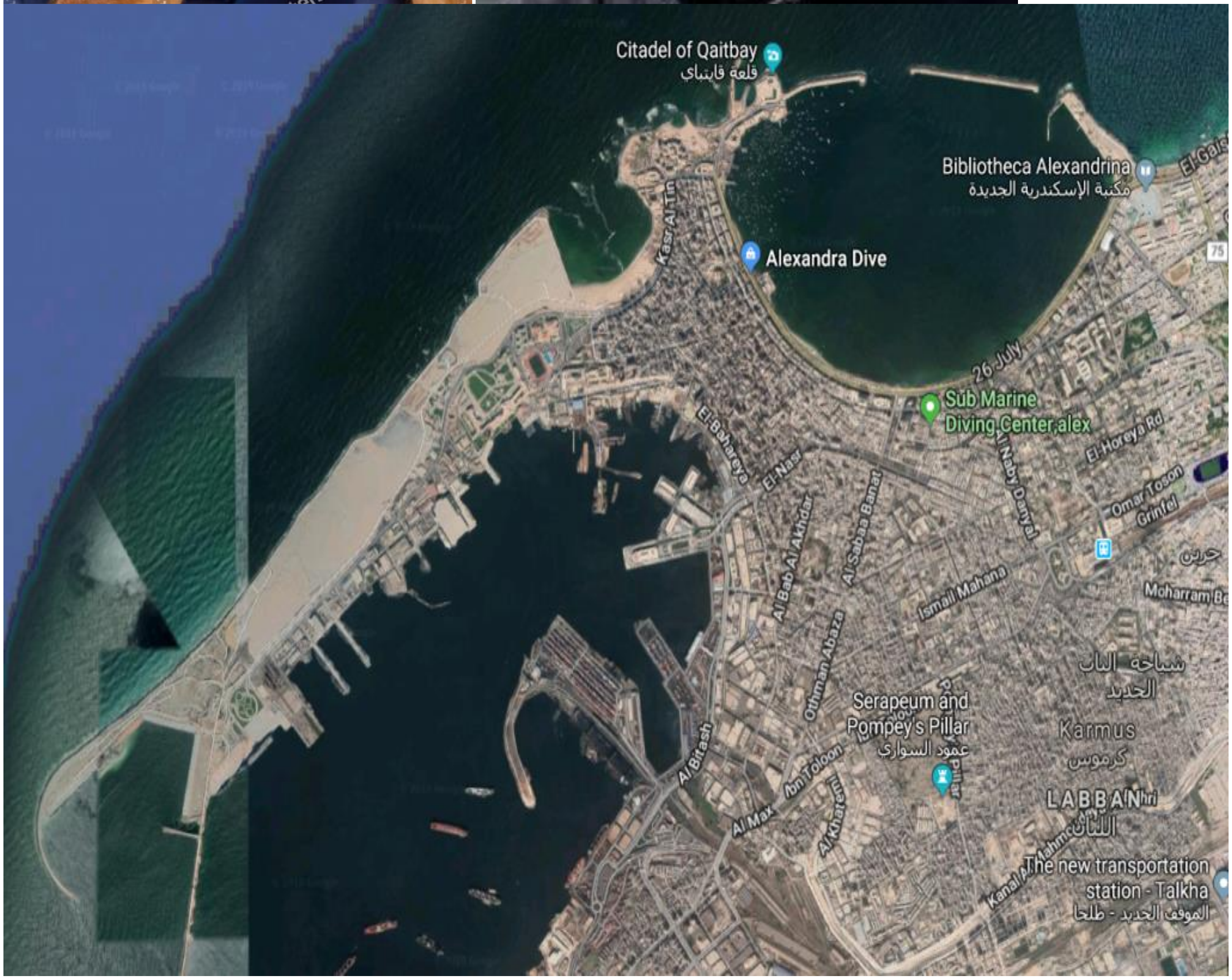
French archaeologists led by Jean-Yves Empereur re-discovered the physical remains of the lighthouse in late 1994 on the floor of Alexandria's Eastern Harbour. He worked with cinematographer Asma el-Bakri who used a 35 mm camera to capture the first underwater pictures of the scattered remains of collapsed columns and statues. Empereur's most significant findings consisted of blocks of granite 49–60 tonnes in mass often broken into multiple pieces, 30 sphinxes, 5 obelisks and columns with carvings dating back Ramses II (1279–1213 BC). The cataloging of over 3,300 pieces was completed by Empereur and his team at the end of 1995 using a combination of photography and mapping. Thirty-six pieces of Empereur's granite blocks and other discoveries have been restored and are currently on display in Alexandria museums. Subsequent satellite imaging has revealed further remains. In the early 1990s the underwater archaeologist Franck Goddio began exploration at the opposite side of the harbor from where Empereur's team had worked.

Subsequent satellite and sonar imaging has revealed the additional remains of wharves, houses and temples which had all fallen into the ocean as a result of earthquakes and other natural disasters. It is possible to go diving and see the ruins. The secretariat of the UNESCO Convention on the Protection of the Underwater Cultural Heritage is currently working with the Government of Egypt on an initiative to add the Bay of Alexandria (including the remains of the lighthouse) to a World Heritage List of submerged cultural sites.

The lighthouse was severely damaged by three earthquakes between AD 956 and 1323 and became an abandoned ruin. It was the third longest surviving ancient wonder (after the Mausoleum at Halicarnassus and the extant Great Pyramid of Giza), surviving in part until AD 1480, when the last of its remnant stones were used to build the Citadel of Qaitbay on the site.
In 1994, French archaeologists discovered some remains of the lighthouse on the floor of Alexandria's Eastern Harbour.[4] In 2016 the Ministry of State of Antiquities in Egypt had plans to turn submerged ruins of ancient Alexandria, including those of the Pharos, into an underwater museum.

Wreckers: Legend has it that the people of the island of Pharos were wreckers; hence, Ptolemy I Soter had the lighthouse built to help guide ships into port at night. *Pharos* became the etymological origin of the word "lighthouse" in Greek (*φάρος*), many Romance languages such as French (*phare*), Italian and Spanish (*faro*), Catalan, Romanian (*far*) and Portuguese (*farol*), and even some Slavic languages like Bulgarian (*far*). In Turkish, Serbian and Russian, a derived word means "headlight".

Reconstruction: Since 1978 a number of proposals have been made to replace the lighthouse with a modern reconstruction. In 2015, the Egyptian government and the Alexandria governorate suggested building a skyscraper on the site of the lighthouse as part of the regeneration of the eastern harbour of Alexandria Port. The plan was opposed by Alexandria-based sociologist Amro Ali.


Citadel of Qaitbay
قلعة قايتباي
Bibliotheca Alexandrina
مكتبة الإسكندرية الجديدة
El-Gaish
Kasr Al Tin
Alexandra Dive
26 July
Sub Marine Diving Center alex
El-Horeya Rd
Omar Toson
Grinfel
جرين
Moharram Be
El-Bahareya
El-Nasr
Al Bab Al Akhdar
Al Sabaa Banat
Al Naby Danyal
Ismail Mahana
شياخة الباب الجديد
Othman Abaza
Serapeum and Pompey's Pillar
عمود السواري
Karmus
كرموس
LABBAN
اللبان
Al Bitash
Al Max
Ibn Toloon
Al Khateeri
The new transportation station - Talkha
الموقف الجديد - طلخا

CHAPTER VI

The Lighthouse as a wonder of the world

The seven wonders of the world

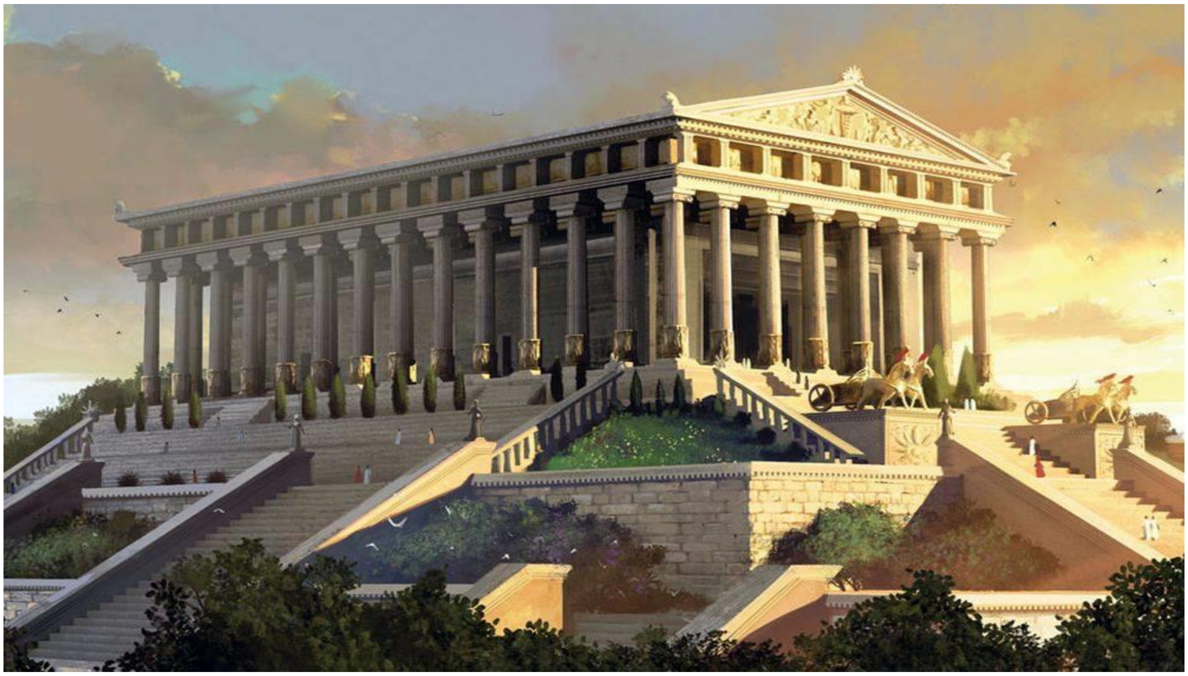
The 7 Wonders of the World are a list of ancient monuments built between the 3rd millennium BC for the oldest and the 3rd century BC for the most recent. They have the characteristics of having marked their eras, giving glory to the civilizations that erected them. Here is the list.

Pyramid of Cheops

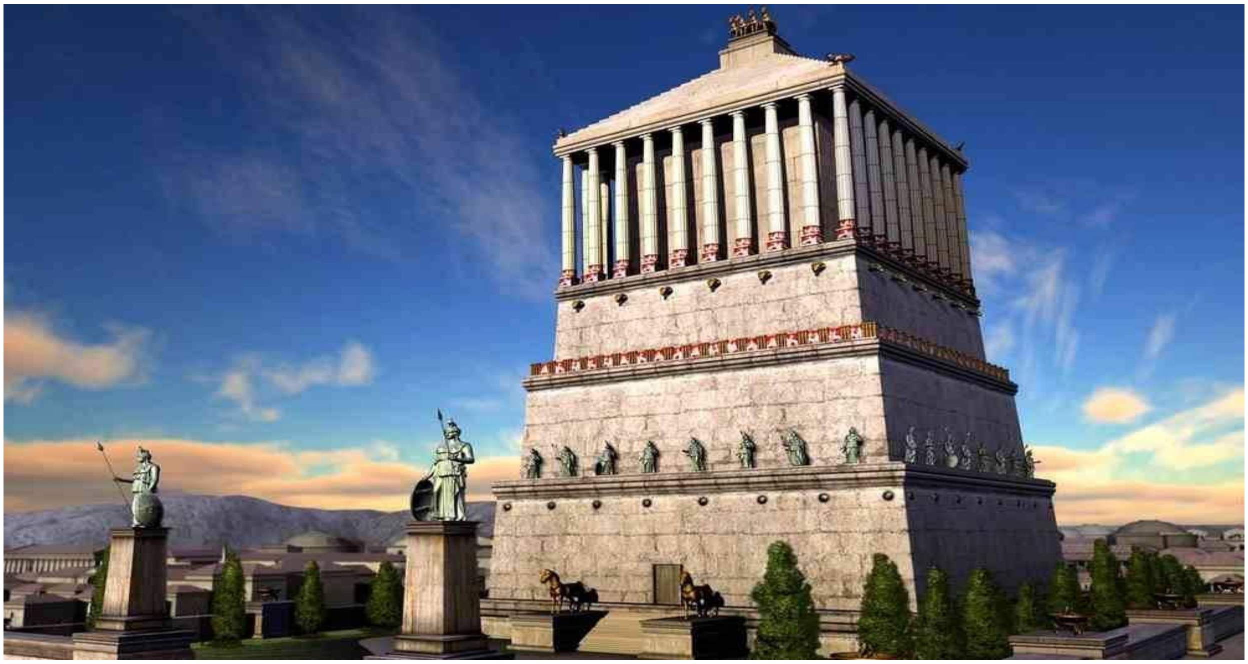
Gardens of Babylon

Statue of Zeus

Temple of Artemis



Mausoleum of Halicarnassus



Colossus of Rhodes

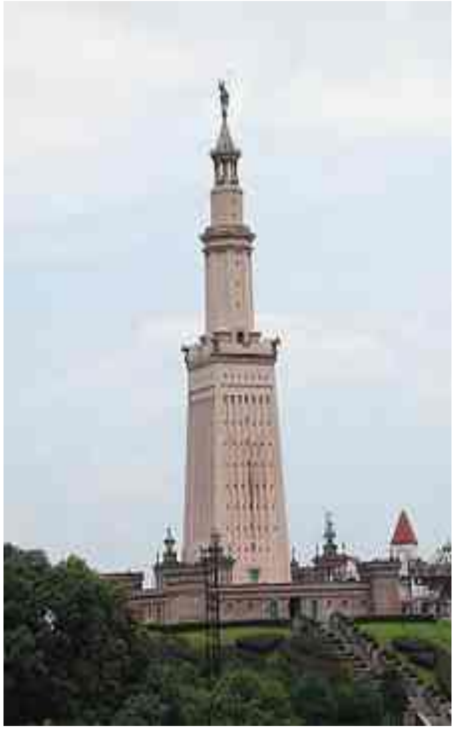
The lighthouse as a model

The lighthouse of Alexandria has always been a model for maritime activity around the Mediterranean. It can be found in several similar forms in various countries such as Egypt, Libya, Algeria, but also in France, Italy, Spain and even in Great Britain where the shape of the Dover lighthouse, built at the Roman period, was inspired by that of Alexandria.

Most of these lighthouses have disappeared nowadays, and those that are still in place are either still in use, and in this case they have been modernized to the point where they no longer find antique or abandoned, and in this case the remains are sometimes in good condition, but most of the time they are strongly overhauled over time.

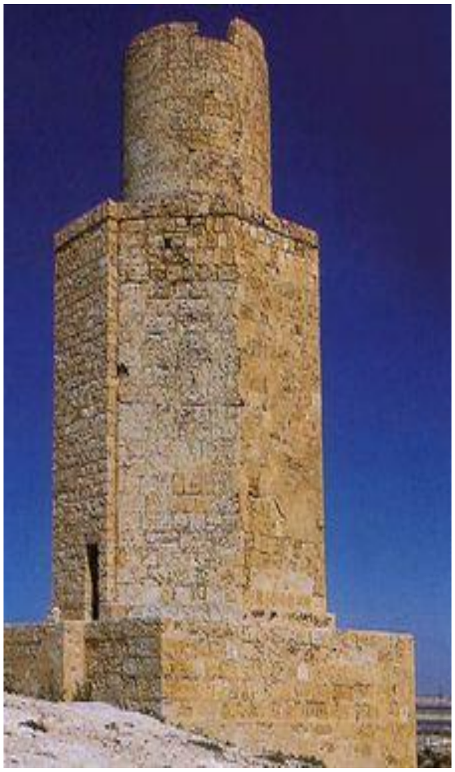
Having survived to the Middle Ages, the lighthouse of Alexandria could serve as a model for various buildings of the Western and Eastern world at different times. The list below is of course not exhaustive, it is content to give some places that have been inspired by this lighthouse for their architectures. We can see that the periods are not very variable, all the lighthouses resembling this model were built during Antiquity, even those which today have a modern aspect because it is simply that they were maintained long enough for us appear to be recent.

That of Corunna, in Spain, and that of Messina, in Italy, is still in operation.List of copies of the lighthouse of Alexandria ...... or at least whose architect was obviously inspired by its form.



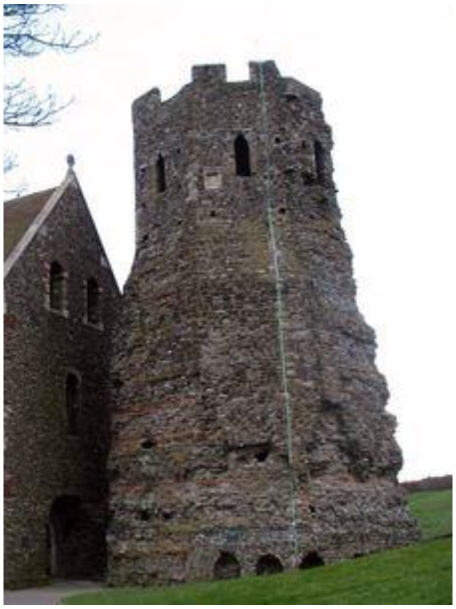
Window of the world. The replica of Window of the World Park (China)

China has recently built a giant amusement park in which the wonders of the world are reproduced. The lighthouse of Alexandria occupies an important place, it is very visible from everywhere. This reproduction seems quite faithful to the original lighthouse, for what we know.



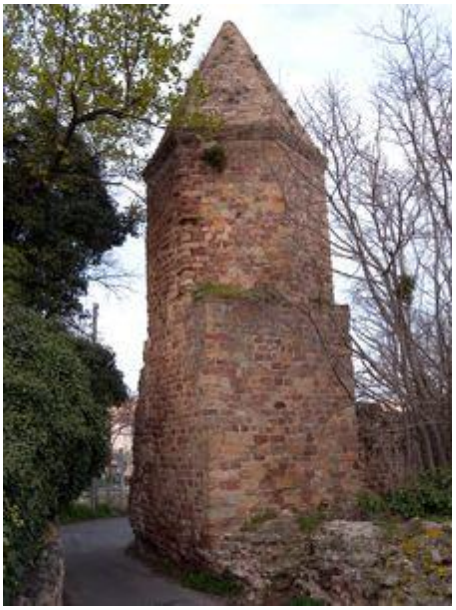
*Taposiris Magna.*The Taposiris Magna tower (Egypt)

Taposiris Magna is a contemporary city of the lighthouse of Alexandria having disappeared at the end of Antiquity. It was located 45 Kms to the west. Particularly developed during the Hellenistic period, it possesses within it a temple dedicated to Osiris in which is an impressive tower because it is the only building of the site that emerges from the ruins. This tower has the same characteristics as the headlight, with a square base, an octagonal intermediate part and a cylindrical top. The base is however much shorter, although the photo opposite does not take into account the natural burial of the base of the tower by the climatic conditions that have agglutinated the sand at its feet since antiquity.



Lighthouse of Douvres. The Roman Lighthouse of Dover (Unitd kingdom)

Despite its medieval appearance, this old lighthouse is from Roman times, but it was restored during the Middle Ages. On a square base that is poorly recognized, the elevation is well-orctogonal and the old reproductions show us a cylindrical summit which no longer exists today. This lighthouse is in the town of Dover, England.



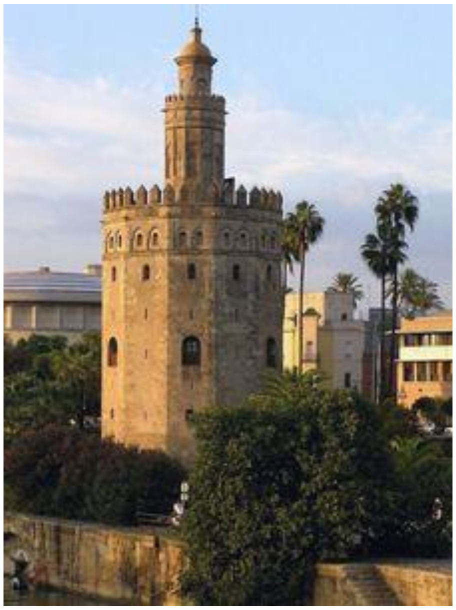
Lantern of Fréjus. Lantern of Fréjus (France)

Named Portus Julii in the ancient times, the city of Frejus was an important gateway to the territory of Southern Gaul. Its port was endowed with a lighthouse modeled on that of Alexandria, but terminated by a pyramid. It was only 10 meters high and could have served as a landmark rather than a lighthouse for sailors.

Due to the coast's advance on the sea, the site of this lighthouse is currently inland and can be admired without problem. It is actually observed, it has its square base and its elevation is octagonal.

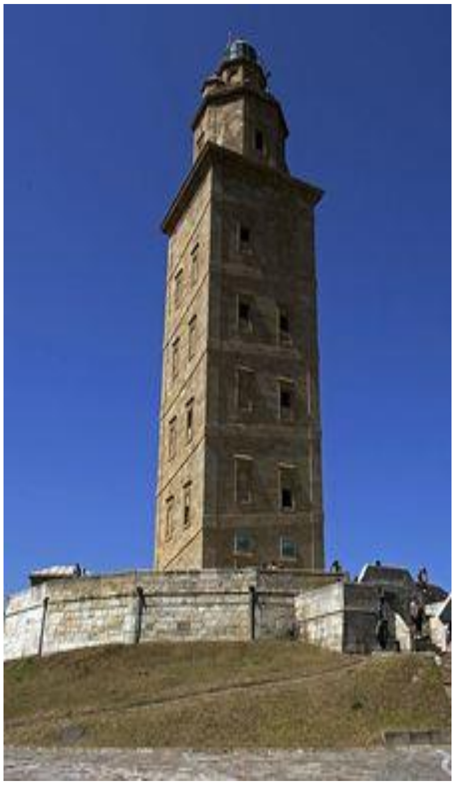
The tower of Boulogne (France)

It is also a Roman lighthouse, apparently built in the first century AD by the emperor Caligula. She was then at the port of Gesoriacum (Boulogne-sur-mer). This lighthouse no longer exists today, but the belfry of the city recalls the shape of the lighthouse of Alexandria, so it seems that there is a relationship between the two, especially since on the English coast the city of Dover hosts a lighthouse, partly ruined, almost identical.



*Torre del Oro.*The Torre del Oro at Sevilla (Spain)

Magnificent building in the heart of Seville, Spain, La Torre del Oro (Golden Tower) is a shape reminiscent of the lighthouse of Alexandria. It is certainly not a copy, but the truncated roundness of the building recalls the octagonality of the Alexandrian lighthouse. Unlike the other buildings on this page it is not a lighthouse but a tower defense.



*Lighthouse of La Corogne.*Lighthouse of La Corogne (Spain)

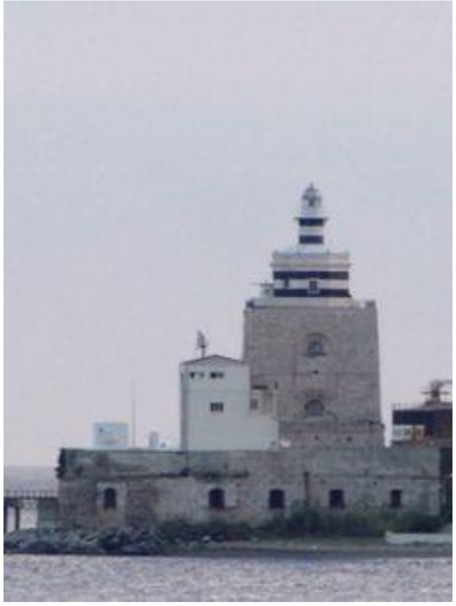
This lighthouse is probably the one that comes closest to its model. Massif, high and imposing, it has a strong square base rather high and an octagonal tower a little too short compared to the original. It is located in A Coruña, in Galicia (Spain). It is usually called the Tower of Hercules.

It was built by Servius Lupus during antiquity and it was restored at several points in its history to reach us in this good state of conservation. It is a rarity in that most of the ancient lighthouses no longer exist today, or at least rigor exists but are only archaeological remains. That of Corunna is not only in good condition but still serves as a lighthouse, as in ancient times.

Leptis Magna,The lighthouse of Leptis Magna (Lybia)

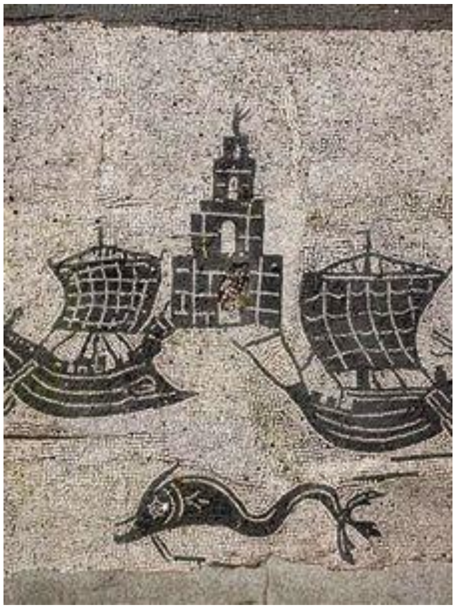
Libya was a Roman province like the whole Mediterranean. The town of El Khums was called Leptis Magna at the time and it was a port whose lighthouse was well known in the ancient world. It was built on the basis of three superimposed square towers, of diminishing size. It is unfortunately destroyed these days, but the site has a large number of remains of that time.

This lighthouse was built during the Roman period between 193 to 235 AD.



Messine. The lighthouse of Messina (Italy)

Messina is an Italian city on the edge of the destroyed by the same name, a strait separating the mainland from Sicily. This sea passage is the object of many marine currents and has therefore always required many lighthouses all along the passage. This one is also of Roman time but was modernized. It is mounted on a square base and surmounted by an octagonal tower.



Lighthouse of Ostie.Lighthouse of Ostie (Italy)

Ostia is an ancient city of ancient Rome, it was the port of Rome, 35Kms west of the city, at the mouth of the Tiber. It was in the first century AD that the Empire finally built a new port at Rome, the old one being too small to handle the increase in freight traffic inherent in the growing power of the empire. The site chosen was that of the mouth of the river where was created not only a port but also a new city: Ostia.

The lighthouse which was built there to direct the ships was of the same style as that of Alexandria. The inauguration of the port took place in 66 AD, by Nero.

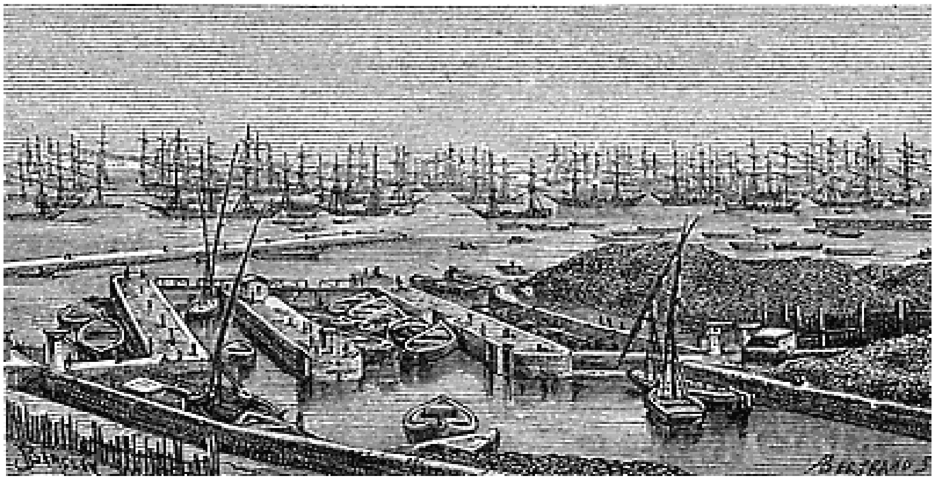
CHAPTER VII

The lighthouse of Alexandria

(The city of Alexandria, Alexander and Mehemet-Ali)

Journey to the Seven Wonders of the World

by Lucien Augé de Lassus (1878)



Port of Alexandria

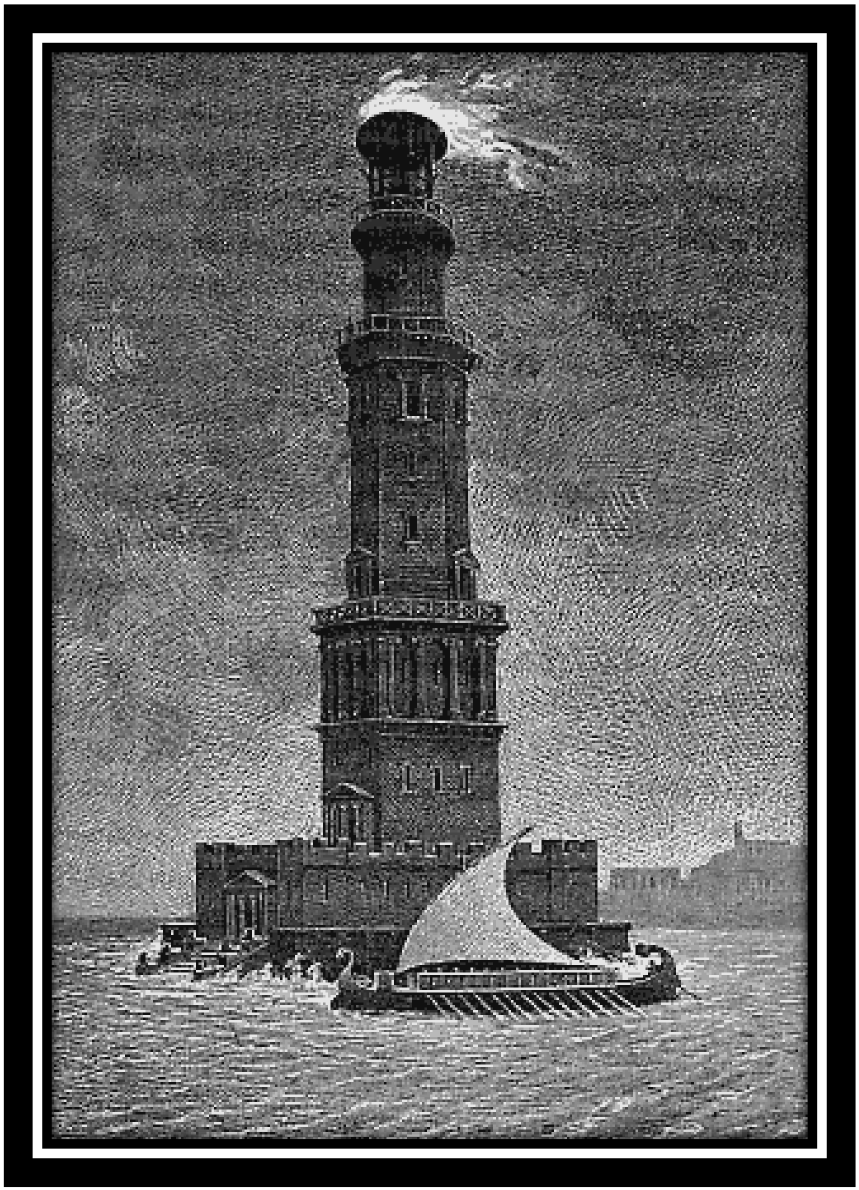
On the evening of December 16, 1874, the “*Moeris*” arrived with a view to Alexandria. Moeris, this is a name which already reminded us of the venerable memories of the land of the Pharaohs. Unfortunately, it was too late to allow us entry to the port.

The pass is difficult; the treacherous shallows, the underwater rocks of which Pliny speaks have not disappeared, and the liners could fall into the traps where the galleys of Caesar and Antoine sometimes perished.

We were forced to stay offshore all night; only the twinkling star of the lighthouse announced Alexandria and Egypt.At dawn, a pilot comes on board. The Moeris moves off and heads slowly towards the port. Buoys, long poles mark and limit the pass.

The first aspect presented by Egypt has neither picturesque grandeur nor originality. The coast is low and arid, the city spread out uniformly shows no imposing ensemble, no curious protrusion, no harmonious silhouette; the eyes wander over this interminable platitude, without finding anything that attracts and holds it. We leave behind a long, unfinished dike; the sea, as if irritated by the new usurpation that is being prepared, throws its foam at it and furiously beats the blocks still poorly secured.

The objects become clearer, however, without becoming more attractive. To our left, the island of Pharos advances, piling up the unsightly buildings of an arsenal and a viceregal palace. An isthmus of ancient construction and said formerly *heptastade* , because it was seven stages in length, connects to the mainland this island thus become a peninsula. This isthmus, where two passages were provided, separated the large port, now abandoned, from the port of Eunoste, the only one that remains in use. The soldiers of Caesar and the Alexandrians fought there several times furiously.



Tower of Babel Representation of the Lighthouse

Lighthouse of Alexandria

Pharos carried, on a rock which ends its eastern extremity, the lighthouse, illustrious among all, the most considerable that the ancients would have erected and the most sumptuous ever. This lighthouse had the architect Sostratus of Cnidus; it cost eight hundred talents, that is to say three million nine hundred thirty-six thousand francs. Built entirely of marble, it was divided into three floors. Square at its base, it became octagonal, then round; he surrounded a gallery which allowed him to go around. The curious that the marble steps had led so far, could take in a glance all of Alexandria, its rich countryside, the Delta crisscrossed with canals, the Nile dragging away its tawny waters and the sea that the silt defiles over an immense space. The fire radiated more than one hundred and ten meters above the shore; you could see it from a distance of forty kilometers.

In support of this summary description, we cite some texts borrowed from ancient and medieval authors.

“This same (eastern) end of the island, says Strabo, is formed by a rock surrounded by water on all sides, surmounted by a multi-storey tower, admirably built in white marble, which bears the same name as the 'Isle. It was raised by Sostratus of Cnidus, favorite of the kings, for the salvation of the navigators as the inscription carries it. Indeed, on a shore which, on each side of Alexandria, is low, devoid of ports, furnished with reefs and shallows, it was necessary to place a high and very remarkable signal, so that the navigators, arriving from the high seas, could not miss the entrance to the port ... The western mouth is not easy either; she does however, does not require as much caution. It gives entry to another port, called Eunoste, within which is a port dug by hand and closed; the one whose opening is masked by the lighthouse tower, is the large port; the two others are contiguous to it at their extremity and are separated from it only by the road called Heptastade ”.

“The entrance to the port, we read in the *Comments* of Caesar, is so narrow that a vessel cannot approach it despite those who are masters of the lighthouse. Caesar, who feared that the enemy might seize it, warned him while he was occupied elsewhere, landed his troops there, seized it and garrisoned it. In this way he was in a position to surely receive food and aid by sea; so he sent to all the countries in the neighborhood to get them. ”

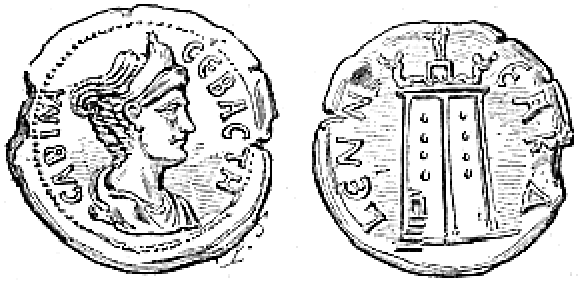
Flavius Josephus, in his *History of the War of the Jews and the Romans*, speaking of a so-called Phazael tower erected in Jerusalem, tells us: "Its shape resembled that of the lighthouse of Alexandria where a fire always lit serves as a lantern for the mariners to prevent them from giving through the rocks which could make them be shipwrecked ; but this one was more spacious than the other ”.

"The entrance to the port of Alexandria," he said in a previous passage, "is very difficult for vessels, even during calm, because the mouth is very narrow, and rocks hidden under the sea force them to turn away from their straight road. On the left side, a strong dike is like an arm that embraces the port: and it is kissed on the right side by the island of Pharos, in which we built a very large tower, where a fire, always lit and whose clarity extends up to three hundred stadiums, makes mariners aware of the route they must follow ”.

Masoudi, an Arab writer from the fourth century Hegira, quoted by Makrisi, a more modern Arab writer, speaks of the lighthouse as follows: “Between the lighthouse and the city of Alexandria, there are now about a thousand; the lighthouse is on the end of a tongue of land surrounded by water on all sides and built on the mouth of the port of Alexandria; but not the old port where the boats do not approach because of its distance from the dwellings ... The height of the lighthouse currently is about two hundred and thirty cubits. Formerly, it was about four hundred cubits; time, earthquakes and rains have deteriorated it ... Its construction has three forms; it is square up a little less than half and a little more than a third; there, the construction is in white stone; which is about a hundred and ten cubits. Then, the figure becomes octagon and it is then built of stone and plaster (relatively modern restoration, no doubt) in the extent of sixty and a few cubits. A balcony surrounds it, which allows you to walk around. Finally, the upper part is round ... A writer says he measured the lighthouse and found two hundred and thirty-three cubits. It is three stories high. The first floor is a square one hundred and twenty-one and a half cubits; the second is octagonal, eighty-one and one-half cubits; the third floor is round; he is thirty-one and a half cubits.

Finally, another Arab, Ibn-Batouta, who was born in Tangier in 1502 and traveled for twenty-four years to Russia, Asia Minor, Syria, Spain, Sudan and even Egypt, also speaks of the lighthouse of Alexandria.

“On this trip, I visited the lighthouse and found one of its faces in ruins. It is a square building that soars through the air. Its door is raised above the ground and opposite is a building of similar height which is used to support planks on which one passes to arrive at the door of the lighthouse. When these boards are removed, there is no way to get to the lighthouse door. Inside the entrance is a site where the caretaker of the building stands. Inside the lighthouse are many apartments. The width of the passage leading into the interior is nine spans, and the thickness of the surrounding wall is ten spans. The lighthouse has forty spans on each of its four faces.



An ancient medal, bearing the effigy of Sabine, wife of the Emperor Hadrian, carries on its reverse a representation of the lighthouse of Alexandria, but summary, inaccurate and contrary to all likelihood.

Everything disappeared from the ancient lighthouse until the last block.

The modern lighthouse does not even mark the location of its glorious ancestor; it occupies not the eastern extremity, but the western extremity of Pharos. It is a creation by Méhémet-Ali, intelligent no doubt, very happy, but this sixty-five meter tower has no other merit than its usefulness. On the very threshold of Egypt, what was shamed what is. And never revenge; in the land of the Nile, the past everywhere crushes the present, if not for its magnificences, it is, and that is enough, for its memories.

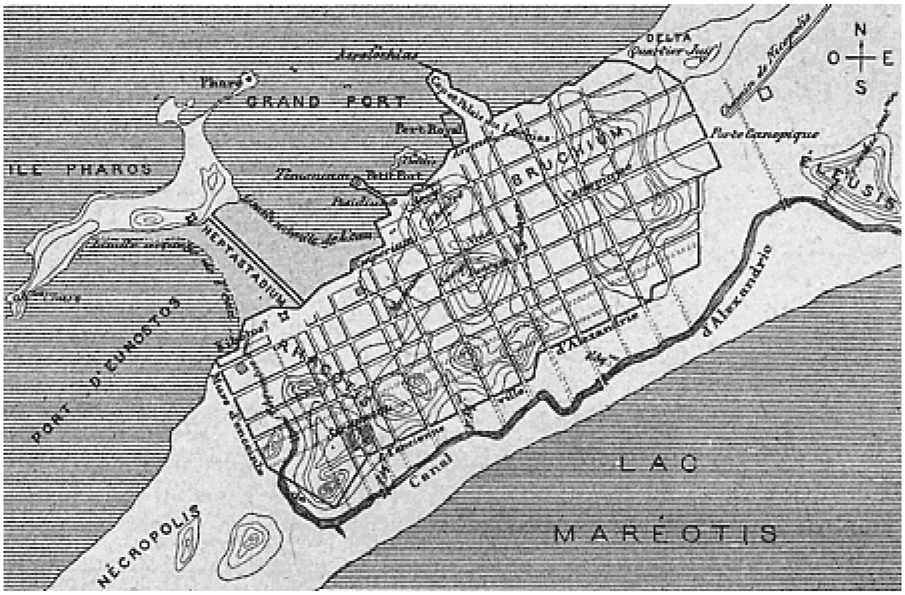
The Moeris has dropped anchor. All around us are wet large ocean liners; their black chimneys throw the stain of their smoke to the blue sky. Near Pharos, a few warships align the mouths of the cannons on their dark sides. Sailing ships, bricks, robust three-masts, cute schooners, heavy feluccas, light layers, close together, close together, steal the city from us; the yards intertwine, floating forest whose ropes are lianas.

Two men, two princes, who thought greatly and who wanted strongly, made Alexandria: Alexander and Mehemct-Ali, the second, after more than twenty centuries apart, taking up the work of the first.

What Mehemet-Ali achieved, Bonaparte had meditated to undertake, and no doubt it would have pleased his pride as a conqueror to associate his name with that of Alexander. But for our French Caesar, Egypt was only a stage, he had too many dreams for his ephemeral victories to produce anything other than a resounding crash.

What ancient Alexandria, Strabo, Caesar, Josephus tell us, failing the ruins that are almost completely gone. Dinocharès had drawn up the plan; it gave the city an area of fifteen thousand paces and the circular shape of a Macedonian chlamyde. In the most flourishing days, the population reached about five hundred thousand souls. This same Dinocharès, tells us the credulous Pliny, had undertaken to make, in magnet stone, the ceiling of a temple dedicated to a certain Arsinoé, sister of the reigning Ptolemy. The statue of the deified princess would have been made of iron, and the magnet attracting it and holding it, it would have hovered in the air, above the head of its worshipers. Death

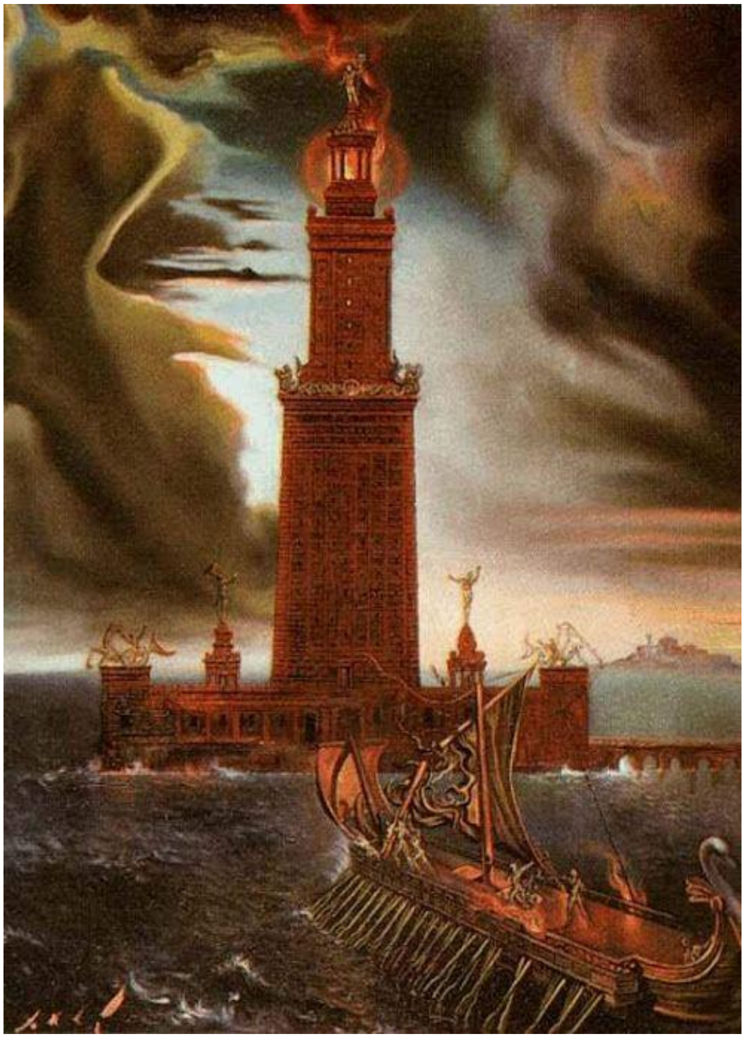
Alexandria, the work of a single will, suddenly improvised creation, presented a perfect symmetry, a skillfully reasoned regularity, unlike the cities that patient labor has formed over the centuries. Excavations and soundings have made it possible to reconstruct the original plan.



The streets, regularly aligned and intersecting at right angles, formed like a gigantic checkerboard. There were boulevards planted with trees, square squares, colonnades, porticoes. Let us not believe however that Alexandria was a city solemnly insipid, according to the ideal of certain engineers; the engineer of Alexandria was Greek, he could not forget it and the city, created by him, associated, with these somewhat uniform magnificences, something of the amiable graces in which the genius of Greece delighted. Besides, baths, temples, palaces stood side by side, for Alexandria had no childhood; hardly born, dethroning Thebes who had dethroned Memphis, she usurped the first row. The Ptolemies had no other capital. Greek dynasty adopted by Egypt and personifying the alliance of the two countries, they lived on the ground which the conquest had delivered to them, but as close as possible to their first homeland.

Alexandria united and summed up two worlds. The Roman proconsuls maintained the seat of government there.Then came the time of the invasions and their terrible devastation; the immense city was no more than a town of seven to eight thousand inhabitants. Damiette and Rosette took advantage of this misery and this abasement; it is to them that a little of the life went which abandoned their illustrious rival. In the

Middle Ages, Damiette and Rosette were more important than Alexandria. Today, Alexandria is rising with a singular speed, and Damiette and Rosette decline with the same speed.



Alexandria, we have said, came out of the ground suddenly, when Alexander had spoken, his rebirth was also almost sudden, and all of a sudden, Alexandria was reborn as a great city. But there is no longer Dinocharès to draw up the plans for, and one cannot find in Yout the Ottoman Empire a less picturesque town. Alexandria strips the rags whose middle ages had dishonored its ruins. We still discover with great difficulty some curious hovels, some lost minarets and ashamed of the rout of Islam; but soon there will remain, retaining some oriental physiognomy, only the sand of the beach and the azure radiating from the sky. The West triumphs over the East, not without noise and without pride.

The place known as the Consuls is the forum of Alexandria. Several consulates, including that of France, are grouped around. The houses, obediently aligned and all European in appearance, draw a large parallelogram. Acacias with huge pods that we find, in the middle of December, covered with lush foliage, are planted there with perfect regularity; they form a green frame where overlaps, turban at the head, saber at the side, a gigantic bronze Mehemet-Ali. It is perched on a high pedestal and affects, not without happiness, the superb airs of a conqueror. On the right, on the left, two wooden kiosks, variegated in garish colors, shelter the military orchestras against the rains that never fall.

Half of the population of Alexandria is made up of a cosmopolitan assembly where the Greeks hold, by the number, the first rank, the French and the Italians, roughly equal, the second and the third. Besides, the confusion of languages shows the confusion of races; three languages compete for the signs, French, Greek and Italian; Arabic appears only by exception, it seems to be only tolerated. The streets develop endless perspectives; their tall houses, cut off by large balconies, are fairly reminiscent of the houses of Naples.

The population is generally as unattractive as its houses. But Alexandria, like Cairo, has its donkeys which everywhere await the walker. Whoever has not seen the donkey from Egypt does not know the donkey. The donkey of Egypt is a cute, awake, docile little beast; it is to these unhappy and sad roussins of our countries what a generous steed of battle is to the famine Rossinante of our cabs. The donkey only lives well in a slightly warm country: the climate of Egypt is particularly favorable to it. With us it is wasting away; further north, he can only live with special care, it is as difficult to keep a donkey in Moscow as a giraffe in Paris. Let us therefore have some indulgence for the unsightly appearance of our donkeys and their difficult character; they are disoriented, they suffer, this is their excuse.

The donkey from Egypt, at the right time! he has a thin, solid leg, light gray hair, a well-constructed head and a pretty design, a keen eye; his long ears stand proud and mobile as soon as you speak, they move like an intelligent shudder. The charming beast! How she trots! It will carry you, it will lead you better than many *ciceroni*, and always surely, limply, quickly. Indicate the direction you want to take, she will guess immediately if you want to see the column of Pompey or the obelisks of Cleopatra. The crowd is compact, swarming everywhere, do not be afraid, you will not hit anything or anyone, you will pass everywhere, then a cheerful roar will announce that you have arrived.

The harness is picturesque and worthy of the beast that wears it: the saddle is red, sometimes raised with bluish embroidery, and red also the reins. Finally the donkey-driver, bare feet, bare legs, always running, shouting, hitting, marvelously completes the donkey.

The donkey is the truly national mount of Egypt, and this undoubtedly since the most ancient antiquity; we will see, by the testimony of the pharaonic monuments, that the donkey was known and used well before the horse. Even today, apart from Alexandria and Cairo, where the European element is very numerous, the horse is very rare. Some Arabian donkeys cost up to a thousand francs, and often the richest characters have no other mount.

Little seduced by the powdery squares, the noisy squares and all these banal splendours of the present, we hasten to look in the modern city, some vestiges of the city which it replaces. Two monoliths remained standing, glorious survivors; they dominate modern Alexandria from high, and make the memory of ancient Alexandria hover above it. These are the obelisk, known as the *Cleopatra Needle* and the so - called *Pompey* Column .

The obelisk stands at the eastern end of the city, on the edge of the sea. A few bastions that a lean grass struggles in vain to line, crumbling hovels, a stone yard, debris of all kinds , rags, this is the frame. Pink granite is uneasily cut under the bites of steel; here he underwent bites which seemed less frightening, but which, the centuries helping, did more hard work; gnawed by the salty winds, the block has lost its hieroglyphs on two of its faces. This obelisk had a brother who kept it company; we could not see it because it had been covered with earth to protect it from further outrage. He fell, Touvet tells us who sees in this fact a prodigy, and had broken into two pieces the very day of the entry of the Turks into Rhodes. The English, however, have just prevailed, and here he is condemned to the defilement of the London mists.

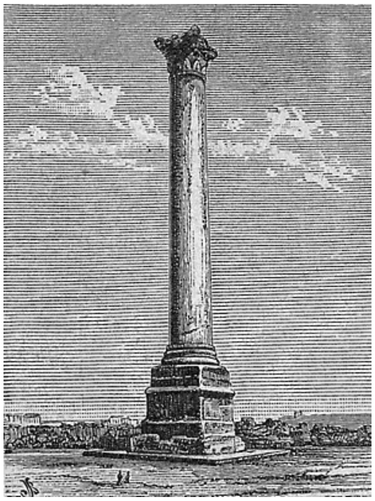
These beautiful blocks decorated the surroundings of a building called the *Caesareum* which was built by the orders of Cleopatra, hence their common name. But they can be proud of a far more distant origin; Tothmes III, of which they keep the cartouche, had drawn them up at Heliopolis, fifteen centuries before.

For eyes that have known for a long time only discolored Europe, everything is surprised and joy in the countries of the East. The smallest incident amuses, nothing seduces, because the light envelops the most miserable things with unexpected magnificence.

We turn our backs on the obelisk, and here comes a line of camels. They walk slowly, gravely, swinging in a regular rhythm, their bundles and the man who is crouching there. As background to this suddenly improvised painting, they are shacks of worm-eaten planks, gray trees of dust, a white rampart, a sky made of azure and gold, then throwing in these lights, dark spots, women who pass draped in their bluish dress.

We leave the city by a door next to the obelisk. The city of Alexandria retains a belt of bastions; but always more populated, always growing, it persists, it seems, to break it and already, on more than one point, it made it burst. The boulevards are breaching and new neighborhoods, all dapper, all joyful, will germinate on the ruins of overturned escarpments, filled ditches, disappeared glacis. Captured from some fierce jail, captives would not display their reclaimed freedom more brilliantly.

We cross a railroad track and descend to the sea. The ground is strewn with pieces of pottery everywhere; debris, confused ruins clutter the shore. Bricks, stones, marbles, granites have often crumbled in large blocks, without escaping the mortar which welds them. We recognize two small vaulted rooms. The columns which divide them into two naves, set in a bizarre arrangement, a cubic drum between two rounded drums. The method of construction, the materials used, the moldings of the capitals, the presence of mortar and baked brick (the ancient Egyptians hardly used anything but raw brick), everything announces a Roman work. The popular,*Cleopatra baths* . Cleopatra certainly never knew them; and it is highly doubtful that we should recognize baths there. Besides, the sea reserves a radical conclusion for these uncertainties. The man had invaded her domain, she took it back. Interrupted hangers, incomplete walls stand on the cliff, they chuck them furiously. Already in the capitals that rolled on the shore, the green garland of algae replaces the erased acanthus; the large pavements still appear visible but flooded. There is a granite barrel lying there, the flow hitting it, enveloping it, as if it had the task of taking it away.



So-called Pompey Column

Baths of Cleopatra to reach the column of Pompey, the second monument of Alexandria really worthy of the name, you have to go back to town and cross it entirely. Along the way, we find, set in the corner of a modern house, some basalt statuettes without head or hands. A colossus of porphyry appears further away, gravely seated on its frone. He was broken in the middle, and his decapitated chest lay at his feet. This is a work from the Byzantine era; the heaviness and the coarseness of the work prove it all too well.

A loud debate attracts the crowd. A violent argument arose between a camel and his camel driver. The camel driver wants to go forward, the camel wants to go back. This one pulls the halter on one side, this one pulls it on another, this one screams, this one growls. The man wants to go back to town, the beast wants to return to the fields that she regrets. The two stubborn balances for a long time. The man at the end triumphs however, a hail of blows avenges his little-known authority.

Further on, a large doorway frames heaped onions which form yellow pyramids. From the merchandise to the surrounding squatting merchants, the light carries its reflections, spreading like gold powder. Ceaselessly trotting the little donkeys followed by their donkey.

Here we are soon and without leaving the enclosure, in the middle of rich cultures. Countless palm trees sprout there, crowned with their green plume. Irrigations, ingeniously combined, maintain freshness and fertility everywhere. The air is full of the endless squeak of the norias; young mules are condemned to the eternal labor of turning their wheels. The vegetables are green, framed by small ditches that are in turn flooded. Fig trees turn their antlers on the dripping edge of the wells.

Sometimes a man embraces the slender bole of a palm tree; he climbs, there he hangs on the top that his feet are wavering, then he grabs the hanging clusters and plucks black or red dates with both hands.

After the white walls, the arid shores, how these opulent orchards rest the eyes! But the city grew and attacked them from all sides; it launches its streets through the forest, the trees fall under the ax and the decapitated trunks will roll in the dust.

At the edge of a small path that still looks rustic, a building from the Roman era left two Doric columns and some vague substructures standing. Near there appears the column of Pompey.

We know that Pompey only came to Egypt to have his head cut off. When posterity, obsessed with this bloody memory, gave the name of this illustrious victim to the most beautiful monument in Alexandria, it was perhaps an act of legitimate expiation, but at the same time a most flagrant archaeological nonsense implausibility. The famous column was actually erected by the prefect of Egypt, Publius under the Emperor Diocletian and in his honor. It measures thirty-two meters in total height, and the bole alone, a pink granite monolith, twenty-two meters.

This column does not seem to have been originally isolated as we see it today; she probably decorated one of the Serapeum courses. This richest and most revered temple in Alexandria still attracted a large number of worshipers, even in the time of Emperor Theodosius, after the official triumph of Christianity. We know that the pagan cults remained for a long time in great favor with a considerable part of the Egyptian population; Philae still had colleges of priests under the Marcian emperor, that is to say around 450. Also the same Theodosius promulgated an edict which ordered the destruction of all the pagan temples and shrines of Egypt; this edict, luckily, was only very incompletely executed; but to Alexandria came a little later a man who could not miss such a fine opportunity to signal his hatreds and especially to fill his coffers. We are talking about Patriarch Theophile, the furious adversary of Saint John Chrysostom who owed him his persecutions, his banishment from Constantinople and his death. Théophile raised the populace, and it was only too easy in a city divided between several enemy cults. The devotees of Serapis wanted to defend their temple, but in vain, some were massacred, and everything was looted, devastated, torn to pieces. The sad hero of this victory did not fail to make a large share in the booty. but to Alexandria came a little later a man who could not miss such a fine opportunity to signal his hatreds and especially to fill his coffers. We are talking about Patriarch Theophile, the furious adversary of Saint John Chrysostom who owed him his persecutions, his banishment from Constantinople and his death. Théophile raised the populace, and it was only too easy in a city divided between several enemy cults. The devotees of Serapis wanted to defend their temple, but in vain, some were massacred, and everything was looted, devastated, torn to pieces. The sad hero of this victory did not fail to make a large share in the booty. but to Alexandria came a little later a man who could not miss such a fine opportunity to signal his hatreds and especially to fill his coffers. We are talking about Patriarch Theophile, the furious adversary of Saint John Chrysostom who owed him his persecutions, his banishment from Constantinople and his death. Théophile raised the populace, and it was only too easy in a city divided between several enemy cults. The devotees of Serapis wanted to defend their temple, but in vain, some were massacred, and everything was looted, devastated, torn to pieces. The sad hero of this victory did not fail to make a large share in the booty. A little later came a man who could not miss such a great opportunity to report his hatreds and especially to fill his chests. We are talking about Patriarch

Theophile, the furious adversary of Saint John Chrysostom who owed him his persecutions, his banishment from Constantinople and his death. Théophile raised the populace, and it was only too easy in a city divided between several enemy cults. The devotees of Serapis wanted to defend their temple, but in vain, some were massacred, and everything was looted, devastated, torn to pieces. The sad hero of this victory did not fail to make a large share in the booty. A little later came a man who could not miss such a great opportunity to report his hatreds and especially to fill his chests. We are talking about Patriarch Theophile, the furious adversary of Saint John Chrysostom who owed him his persecutions, his banishment from Constantinople and his death. Théophile raised the populace, and it was only too easy in a city divided between several enemy cults. The devotees of Serapis wanted to defend their temple, but in vain, some were massacred, and everything was looted, devastated, torn to pieces. The sad hero of this victory did not fail to make a large share in the booty. furious adversary of Saint John Chrysostom who owed him his persecutions, his banishment from Constantinople and his death. Théophile raised the populace, and it was only too easy in a city divided between several enemy cults. The devotees of Serapis wanted to defend their temple, but in vain, some were massacred, and everything was looted, devastated, torn to pieces. The sad hero of this victory did not fail to make a large share in the booty. furious adversary of Saint John Chrysostom who owed him his persecutions, his banishment from Constantinople and his death. Théophile raised the populace, and it was only too easy in a city divided between several enemy cults. The devotees of Serapis wanted to defend their temple, but in vain, some were massacred, and everything was looted, devastated, torn to pieces. The sad hero of this victory did not fail to make a large share in the booty. but in vain, some were massacred, and everything was plundered, devastated, torn to pieces. The sad hero of this victory did not fail to make a large share in the booty. but in vain, some were massacred, and everything was plundered, devastated, torn to pieces. The sad hero of this victory did not fail to make a large share in the booty.

The Serapeum was, according to the ancients, after the Capitol, one of the most magnificent temples in the world. Entirely constructed of marble, it had, inside, three metal coatings, the first of copper, the second of silver, the third of gold.

Of so many splendors the memory alone has remained, because if the column of Pompey was framed in some courtyard of the Serapeum, it is the work of another age and another people; the Serapeum existed long before Diocletian. Ibn-Batouta, the Arab traveler whom we have already mentioned, claims that in his time the climbing of the column of Pompey was undertaken and fortunately accomplished. An arrow to which a rope was attached was thrown over the marquee and the rope, sliding over the granite, went to hang on the other side. By means of this cord, no doubt very light, a much stronger cable was raised and a man clinging to it, hoisted himself up to the peak.

The column of Pompey occupies the top of a powdery and rocky plateau. A high square base carries the barrel which, in turn, carries a capital whose chisel has somewhat brutally sculpted the Corinthian acanthus. Nothing could be simpler, but by its very mass, this monument is imposing and its isolation still increases it. Near there are statues of broken black basalt lying down with their noses in the dust; they surround with their ruins, the colossus which survives them. Sometimes a little girl climbing them, flexible, light, playful and fierce like a goat, she spans their enormous legs, she hooks her little bare feet to their royal cartridges, and triumphant, makes herself a pedestal of their high tiara.

Further on is a vast cemetery, for new Alexandria departs, as if with religious respect, from this land which for so long was holy. No enclosure, no barrier encloses this cemetery; the graves pressed side by side, all white, seem like blocks of marble abandoned on a vast site. Often an upright stone, funeral stele, bears the name of the dead; at its feet, in a small circle of masonry, vegetates a thin aloe, sad plant, holy however and which preserves from the evil eye, the only one of the rest which agrees to live in this arid soil and made of human ashes. All this radiates furiously and, on the yellow sand, the brown rags of a few women praying are abruptly removed.

The plateau where the column of Pompey stands enthroned covers large catacombs. Several steep wells, give access, difficult access, dangerous, because it is necessary, to undertake this adventurous descent, have, like the Arabs, legs that never bend and feet that never slip. Also, little concerned with trying reckless gymnastics, we go, a little further, to seek a more convenient entry. Besides, the walk in this underground city is soon interrupted; the ceilings have collapsed in several places and the rubble is obstructing the galleries. Three rooms of a regular arrangement, and of a rather great height are cut in the tuff. They superimpose, on their walls, several rows of

A canal connects Alexandria to the Nile and through the Nile to Cairo. Created by the ancients, it was restored by Méhémet-Ali. Alexandria could not exist without him, because only he brings fresh water to this sandy beach and with it greenery, fertility, life.

The banks of this canal are the favorite promenade of the Alexandrians. Willows, acacias, sycamores, intertwining their powerful antlers, form an arch of unbroken foliage. The staggered gardens, like so many charming oases, display splendid vegetation. There the conifers, coming from America, erect their gracefully symmetrical pyramid, the orange trees form groves, the banana trees throw their immense leaves and sometimes bend at the weight of their bunches of fruit, then the cacti nestle at the foot of some rocks and the lianas, suspended in garlands, throw flower walkways from one tree to another. These jealous gates enclose these beautiful gardens or sometimes hedges of giant reeds. The canal has silty waters like the Nile from which it borrows them; the canges, protruding from their long yard the tops of the tallest trees, sail there slowly, while the flotilla of ducks catches and crosses near the edge.

This is the aspect of the canal on the outskirts of Alexandria; but where it ends up in the city, the aspect changes completely. The canges are more numerous and seem to be fighting to find a place at the quay. No more orchards, no more gardens; shops, warehouses; more trees, masts; more elegant riders, more rich crews, a busy crowd and noisy porters. We no longer wander, we work. The enormous bundles are piled up in ramparts; we roll them, we push them, we throw them heavily, sometimes the canvas tears, and cotton escapes from these wounds.

Alexandria train station is located a little outside the city. A recently opened route provides easy access. Dotted with gas burners and telegraph poles, it unfolds, wide, solemn, triumphant; but this triumph was expensive. What ruins all around! It seems that progress has made its way here with cannon shots. The ground, sliced, dug to a depth sometimes considerable, forms on each side of the powdery cliffs. From the mud houses, miserable dens hang their crumbling walls and gaping chambers; light freely penetrates its most intimate mysteries. These are districts, entire villages that the pickaxe has gutted. And yet these ruins are still inhabited: we can see muddy rags that are women, swarming beings in the junk who are children. Poor people, this debris is enough to shelter their miseries; they are waiting to leave until these shreds of houses fall on their heads.

The orchards had their share in the disaster. Many palm trees have fallen to make way for the new track and some are still lying across the sidewalks. Near there appear some ancient columns discovered in the excavations. The ruins of the trees and the ruins of the palaces are confused in the dust.

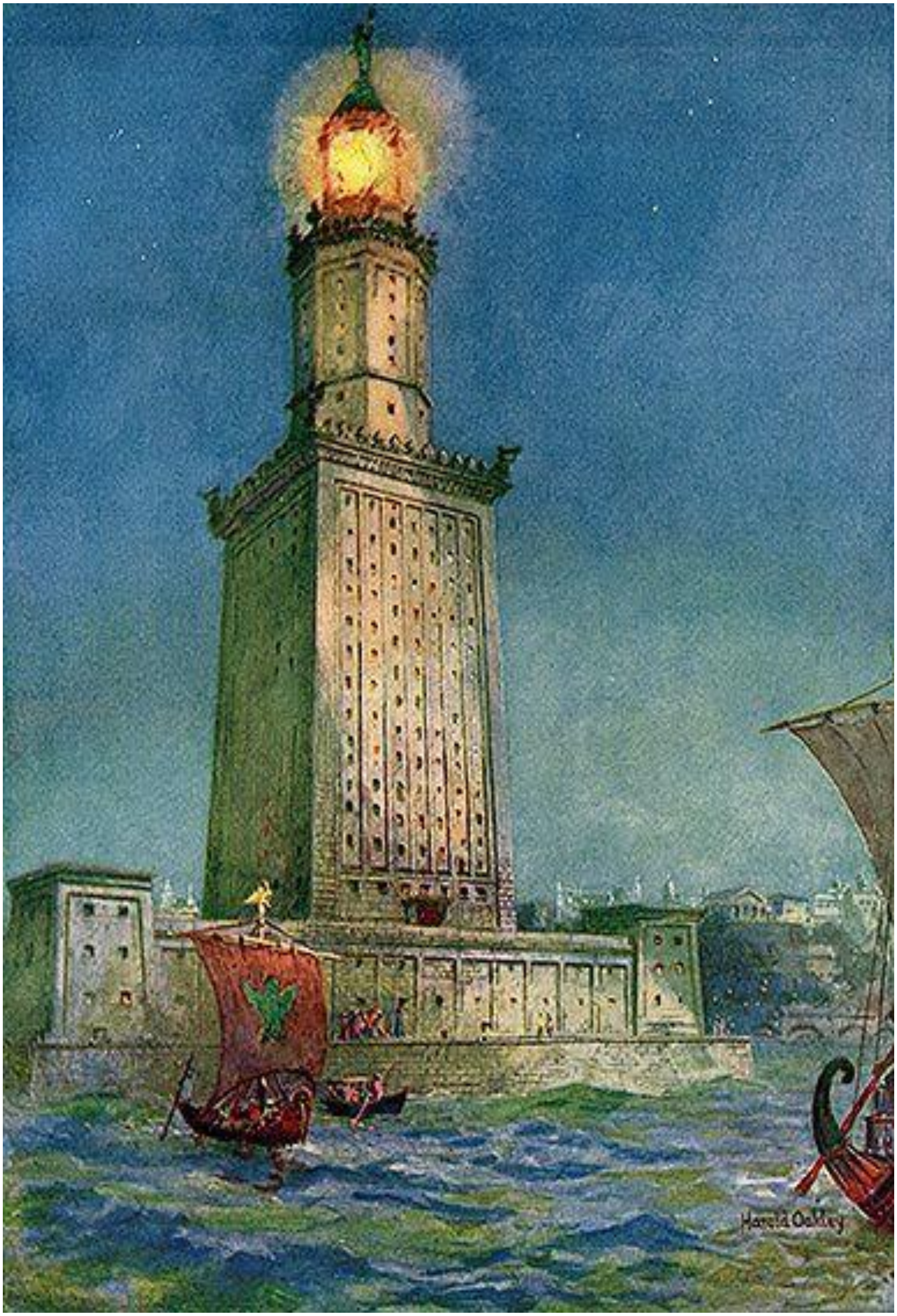
Alexandria station is a shameful barrack, dirty with smoke, stained with soot. No wonder. In Egypt, the monuments which count a few dozen centuries are robust, powerful, beautiful in their immortality; the monuments, or better said, the buildings which date from yesterday, are always crumbling. The more a thing is modern, the more it is worm-eaten.

The Cairo train takes us. The countryside is flat, we run on an alluvial terrain that the silt of the Nile has gradually formed. To our right, Lake Mariout (Mareotis) spreads its muddy waters that large birds touch with their wings. Then come opulent cultures. This is the fat Egypt whose Hebrews so often regretted the good vegetables and especially the succulent onions. The sugar cane forms symmetrical squares and its reeds are bristling with long leaves; they look like phalanxes in battle. The wheat, barely germinating, covers the earth like a light down.

In the body of the man, the arteries, the veins, everywhere circulating, everywhere intertwined, carry blood and life everywhere, thus, in this rich delta, the irrigation channels run, intersect and fertilize the soil. We do not yet see the Nile, but already it is revealed by its benefits. Its water sprinkles the earth that it itself made of its silt, and this beaten silt, dried in the sun made the small villages which, spread out in the countryside. Fortunately it is not raining in Egypt; a passing storm, there would remain of the most beautiful village only a heap of mud.

Besides, these villages of Lower Egypt are all alike. They make up a picturesque decor, but little varied. They are always the same square and low huts, the same terraces that the dogs always growling defend, the same camels that walk through the streets, passing the houses by the height of their hump, the same mosque as a small minaret announces of far away, and the same slender, graceful palm trees that cluster around.

Finally, we cross the Nile; a first time, it is the arm of Rosette, the yellowish waters are framed in fairly flat banks: a second time, it is the arm of Damiette, this one smaller than the first. After about five hours of walking, we reach Cairo.



Harold Oakley

CHAPTER VIII

THE LIGHTHOUSE OF PHAROS: A NARRATIVE-**By Curt Baker**

The word “Pharos” originally referred to either a small island off the coast of Alexandria or the ancient wonder of the world – the brilliant and magnificent lighthouse – that once sat upon it. This term has evolved, however, and now a derivation of “Pharos” is the word for lighthouse in multiple languages and the term “pharology” denotes the study of lighthouses. The transition of a word from holding such specific meaning to one that encompasses an entire field of study is reflective of the colossal significance of the Pharos, the original lighthouse. A member of an elite class of structures — the seven wonders of the world — Pharos served both to guide sailors into the grand ports of Alexandria, thus contributing to the economic success of her host city, and as a physical reminder of Alexander the Great’s expansionism and the dominating spread of Greek influence across the ancient world. Under the rule of Ptolemy I Soter, Alexandria reached the pinnacle of economic and cultural significance in the Mediterranean. Ptolemy I held great pride in his extraordinary city, evidenced in the developments he brought to Alexandria and culminating in his patronage of the marvelous lighthouse. The story begins with Alexander the Great in 331 BC after his victory in Tyre.[1]

After the battle, Alexander led his army southwest towards Egypt, then ruled by Mazaces, a viceroy of Darius the king of Persia.[2] Alexander accepted the surrender of Mazaces, established garrisons, and supplanted Persian rule in Egypt.[3] In his tour of the countryside Alexander "sailed around the Marian lake, and disembarked where is now situated the city of Alexandria….the position seemed to him a very fine one in which to found a city…"[4]

Alexander's positive assessment of the location was understandable — the site was ideal. The area that Alexander chose was a high, flat strip of land running parallel with the coast of the Mediterranean near the western extremity of the Nile Delta.[5] A gradual decline to the south of this high ground led to Lake Mareotis or Marian/Mariut.[6] On the banks of this lake sat a collection of agriculturally-based villages commonly referred to as Rhakotis, which took advantage of the excellent soil around the Nile to plant vineyards and produce oil.[7] To the east ran the Canopic branch of the Nile, accessible through three canals.[8] West of Alexander's location lay desert, eventually the location of the Necropolis.[9] North of the strip rested a large, deep bay, protected from the harsh Mediterranean Sea by the island of Pharos.[10] Even the weather seemed to favor Alexander's choice — a combination of the sea breeze from the Mediterranean and the consistent rising of the Nile kept temperatures cool during the summer when other cities suffered in the heat.[11] Alexander, thrilled about finding such an ideal spot for the city that would bear his name, immediately began planning the foundations, outlining buildings and walls in barley from his supply train.[12] In a disturbing omen for Alexander, birds flew down and ate the grain.[13] However, Alexander's advisors and soothsayers insisted that the omen indicated prosperity and abundance for the city.[14]

By the time construction of the lighthouse began between 280 and 270 BC under Ptolemy I, Alexandria had fulfilled the prophecy of economic wealth and metropolitan growth.[15] Ptolemy I, who served in Alexander's army during the Macedonian campaign against Persia, gained control of Egypt upon Alexander's death in 323 BC. A former companion and bodyguard to Alexander, Ptolemy 1 successfully established Alexandria as a thriving center of international trade and rapid urbanization.[16] Strabo describes the city as being 30 stadia (roughly 4700 meters) long and eight stadia (roughly 1200 meters) wide.[17] The physical growth of the city from Alexander's plans in grain to the flourishing center less than a century later point to this work by Ptolemy.

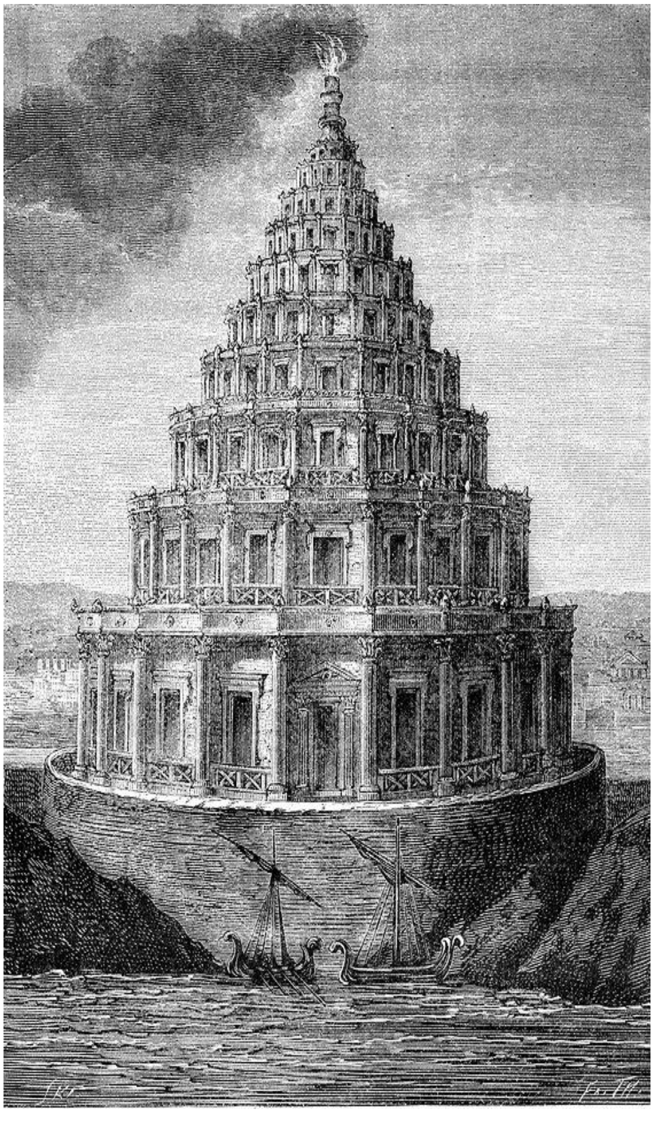
In the third century BC, Alexandria contained five distinct sectors, each populated nearly exclusively by a specific demographic.[18] These included communities from Macedon, Thrace, the Aegean Islands, Asia Minor, and Jews from the Levant.[19] In addition, the number of non-citizens increased during the time of Ptolemaic rule.[20] Two main streets bisected the city, each large enough for pedestrians and wheeled carriages.[21] One of these streets ran from the Canopic gate on the eastern edge of Alexandria to the Necropolis in the west, stretching five miles long and 200 feet wide.[22] Other streets formed a grid system, which crisscrossed the city and intersected at right angles.[23] Walls provided safety to the city, only penetrable through the eastern, western, and southern gates.[24] Ptolemy 1 commissioned the construction of palaces and other significant landmarks including the Library of Alexandria and the burial place of Alexander. Beautiful buildings such as these constituted at least one-fourth of the total buildings in Alexandria.[25] Ptolemy 1 successfully turned plans drawn in barley into an organized, bustling city with a diverse population and a powerful economic presence.

The commercial significance of Alexandria in the third century BC was rivaled by few other cities.[26] Egypt had long provided highly desired products to the Hellenistic world, especially grain and papyrus.[27] Egyptian drugs, spices, and perfumes also spread throughout the Hellenistic world, firmly establishing Alexandria as a legitimate center of trade.[28] Additionally, Alexandria excelled in the production of textiles. Grain, oil, and papyri were also significant local industries.[29] Alexandrian trade with other parts of the Mediterranean centered around many of these exports. Indeed, the island of Rhodes drew most of its revenue from trade with Egypt largely through Alexandria.[30] Often, groups of Alexandrian citizens established a garrison on the oft-frequented islands as a means of solidifying the connection between trading partners.[31]

During the rule of Ptolemy I, Alexandria also traded with Carthage and portions of the Italian peninsula.[32] The significant number of ships in the Alexandrian fleet — 4000 in the navy and over 250 exclusively for commercial purposes by 246 BC — facilitated the booming maritime trade of the city.[33] Foreign merchant ships, ready to be unloaded and reloaded, waited for extended periods of time in the bustling ports of Alexandria, occasionally even multiple days at a time.[34] Alexandria's maritime economy was significant enough for a third-century depiction of the city to be represented by a woman wearing a ship hat.[35]

Although the international trade of Alexandria flourished, commercial pursuits within Egypt outperformed even the most lucrative endeavors across the Mediterranean[36] Lake Mareotis, directly south of the city, provided access to the Nile and the heart of Egypt through numerous canals.[37] Alexandrian trade within Egypt consisted primarily of the import of grain, wheat, and barley but included other products such as honey and linens.[38] Imports of vegetable oil and olive oil, both local and from Syria, also played significant roles in the internal trade of Alexandria.[39] Alexandrian trade with the Upper Nile region centered primarily around wine, cheese, and nuts, each distinctly profitable.[40] Ptolemy 1, the architect of the flourishing Alexandrian economy, also capitalized on the influx of wealth into his city with a complex and comprehensive tax system.

By 258 BC, Ptolemy 1 had developed a customs system that included over 200 taxes for various products.[41] Alexander's successor organized his taxes into two categories: those on the *chora,* internal tariffs on Alexandrian products and those levied against imported and exported products, both within Egypt and across the Mediterranean.[42] As a result of the ancient concepts of property ownership in Egypt, the king was considered the ultimate owner of all



property under his rule. Thus, Ptolemy 1 refrained from imposing harsh tax rates on local industry.[43] Local products such as papyrus, salt, dyes, leather, glass, pottery, some oil, metal workings, and bone-carvings circulated within Alexandria with minimal charges.[44] Products exported from and imported into Alexandria drew much larger taxes.[45]

On imported and exported goods Ptolemy 1 demanded incredible payments from merchants at rates higher than anywhere else in the world.[46] An "internal" tax was levied against anything that traveled across the boundary of Upper and Middle Egypt also at extravagant rates.[47] "External" taxes were also extracted at various points on the Egyptian border, again drawing astonishing income as a result of the high tax rates.[48] Simple food items such as vegetable oil from Syria drew tax rates of fifty percent on their way into Egypt.[49] Additionally, these merchants were often taxed more than once in the process of declaring, selling, and reloading goods.[50]

The revenue generated from these huge taxes contributed to the significant coffers of the Ptolemies. Uniquely Alexandrian coins began to circulate throughout the ancient world as a result of the development of a coinage and banking system.[51] Ptolemy 1 also invested in the infrastructure of Alexandria by improving irrigation systems and promoting agricultural development around the city.[52] Additionally, Ptolemy commissioned work on the harbors of Alexandria.

By the third century BC Alexandrian ports bustled with activity which firmly established the city as a booming economic center and a trading hub for the entire Mediterranean. Ships from across the ancient world carried out nearly all of this commercial activity, visiting the Alexandrian harbors with regularity. Thanks to Alexander's choice location the harbors were suited to accommodate such consistent and heavy traffic, especially in regard to the depth of the bay.

Many harbors around Alexandria gradually became shallower as time passed. This process was a result of the proximity of these bays to the westernmost mouth of the Nile; the silt released from the Nile eventually filled up the natural bays along the coast.[53] The harbors at Alexandria, however, were protected from this gradual shallowing by the natural curvature of the bay and the island of Pharos.[54] A long, thin strip of land, the island of Pharos stretched parallel to the coast.[55] The concave coastline that formed the Alexandrian bay "thrusts two promontories into the open sea…"[56] The island of Pharos sat between these two thrusts of land, leaving enough room in-between for passage of ships but nevertheless effectively capping the Alexandrian bay. This protected the bay from the incoming weather of the Mediterranean and also prevented the silt produced by the Nile from washing into the bay.[57] Thus, the Alexandrian bay was deeper than most, rendering it more conducive to holding merchant ships with deep hulls designed for traversing the treacherous Mediterranean Sea.

In an effort to increase the efficiency of his maritime trade, Ptolemy 1 also commissioned the construction of the Heptastadion: an embankment that linked the mainland to the island of Pharos.[58] Stretching 4270 feet, the Heptastadion also contained an aqueduct and functioned as the only connection from the island to the mainland.[59] The embankment bisected the bay, splitting it into two harbors,[60] which served to combat the weather patterns of Alexandria — summer winds blew from West to North and winter winds blew from North to East.[61] The large embankment served as a buffer against these seasonal winds. As a result of these weather patterns the eastern port, protected during the summer months, became known as the "Great Harbour."[62] Deep enough to moor any ship, the Great Harbour, around which were located the palaces and emporiums of Ptolemy 1, also displayed the magnificence of the city that Ptolemy had built. The western harbor, named Eunestos after one of Ptolemy's relatives, saw less traffic but still functioned as a central element in the maritime trade of the city.[63] In order to allow access between harbors the extreme ends of the Heptastadion were bridged which provided an avenue for ships to transfer from one harbor to the other.[64] Ptolemy 1 commissioned the Heptastadion as a means of improving the availability and safety of his harbor. He also accomplished this by placing the famous lighthouse on the island of Pharos.

A functional external border for the bay, the island of Pharos stretched between the deep lagoon that formed Alexandria's harbors and the Mediterranean Sea. Ptolemy 1 worked to improve the safety of his harbors but he could only influence the natural geography to a limited degree. Rocks littered the entrance to the Great Harbor, both visible and those hidden below the surface of the choppy water.[65] The island of Pharos was surrounded by reefs and shallows which increased the difficulty for ships to enter and exit the harbors.[66] Ptolemy 1 remained set on improving the economic potential of the city and continuing Alexander's dream of making Alexandria a center of Hellenistic culture. He concluded that the most effective way to reach his goals would be the construction of an unprecedented structure: a lighthouse that would both guide ships safely to the harbors of Alexandria and indicate the cultural significance of the city.[67]

Ptolemy 1 fully grasped the incredible significance of this project, evidenced in the man that he selected to design and oversee the construction of the lighthouse: Sostratos of Knidos, the son of Dexiphanes.[68] Already well- established in the political world of the Mediterranean by his mission to Athens in 287 BC, Sostratos received numerous awards and was honored across the mediterranean for his role in diplomatic relations between states.[69] The frequency, quality, and widespread nature of these awards indicate that Sostratos was a well-respected and widely known diplomat in the service of the Ptolemies.

Sostratos' career, however, did not start in politics. Rather, his beginnings were in engineering. Sostratos' father Dexiphanes served as chief aide to Dinocrates, one of Alexander the Great's chief designers.[70]

Additionally, Dexiphanes assisted in the technical work and construction of the Heptastadion.[71] Thus, Sostratos was certainly exposed to construction and architecture from a young age. With this experience, he entered the service of the Ptolemies in the late fourth century BC.[72] His experience had immediate effect as he won the siege of Memphis for Ptolemy 1 by diverting the Nile.[73] Sostratos' fame as an engineer and architect was also influenced by his role in the construction of the Stoa of Sostratos on Knidos, a popular tourist destination in the ancient world.[74] Thus, Sostratos' political career was propelled by his well-respected work and consistent service as an engineer and architect under the Ptolemies.[75] As a result of his good standing and architectural experience, Sostratus was a natural choice to guide the construction of Alexandria's crowning jewel.

Ptolemy's goal in commissioning the construction of the lighthouse of Pharos was two-fold: to improve access to Alexandria for economic purposes and to symbolically indicate the leadership of the city in the ancient world.[76] Well-traveled as a result of his campaigns with Alexander, Ptolemy had seen other magnificent structures such as the Pyra of Haphaestion, the Colossus of Rhodes, and the Artemisium at Ephesus.[77] He also maintained a fondness for Babylonian architectural style — his palace in Alexandria centered around royal gardens, a Babylonian tradition.[78] Thus, the importance of this monument to Ptolemy cannot be understated.

Ptolemy intentionally selected his architect; next came the workers.Most of the manual labor was fulfilled by semi-unskilled laborers, many of them a part of the growing non-citizen population of Alexandria during the Ptolemaic period.[79] These laborers placed materials such as brick, sand, and mortar; cut stone and wood; and carried materials to the construction site.[80] Ptolemy 1 paid the wages for these laborers, in addition to paying for the collection and transportation of many of the materials needed for the construction of the lighthouse.[81]

Sostratos and Ptolemy 1 chose to use primarily a local limestone known as *kedan* for the construction of the lighthouse.[82] A stone of middling hardness, *kedan* was locally accessible and a high quality material.[83] Ptolemy also imported beautiful reddish-purple Aswan granite with which to construct statues around the Pharos.[84]

With ample workers and available resources, Sostratos turned to the actual construction of the building. One year after the turn of the third century BC Sostratos and Ptolemy broke ground on the easternmost part of the island of Pharos and the construction of one of the seven wonders of the ancient world began.[85] Sostratos selected the flattest part of the island and organized the construction of strong sea walls to stave off the invasive Mediterranean Sea.[86] On this flat area, Sostratos directed the construction of a square, masonry platform 110 meters square and seven meters high.[87] The process of laying this platform followed contemporary construction methods during the Ptolemaic period. This consisted of laying small limestone blocks — one meter by one- half a meter — in a grid and filling in a layer of mortar around and on top of the blocks.[88] Often, a thin layer of white plaster was applied as well, giving the appearance of marble.[89] This white-washed masonry platform would serve as the foundation for the Pharos and one that would hold the magnificent structure for centuries to come.

Upon this wide and strong platform, Sostratos directed the construction of the first level of the Pharos. Again using the limestone blocks, although much larger ones, Sostratos built a rectangular base thirty square meters on the bottom[90] and seventy-two meters high.[91] Such a massive and heavy structure necessitated the implementation of unconventional methods to hold the blocks together.

Sostratos showed his ingenuity again by utilizing a model that stayed contemporary for centuries following. First, the workmen drilled holes into the blocks before pouring molten tallow into the cavities. Next, the workmen plunged a heat-anchoring iron into the tallow and poured molten lead into the holes immediately afterwards. This molten lead incinerated the tallow and filled its place, forming a dry and airtight bond. After repeating the process on another block the two would be fused together.[92] This method allowed the construction of such a colossal structure with the limited technology of that time period.

Sostratus, in his design of the second level of the Pharos, paid homage to a key principle in classical Hellenistic architecture. He designed the second layer as an octagon, seventeen meters across and 35 meters high.[93] Although there were numerous characteristics of Greek architecture during this time, the concept of axiality was a pillar of Hellenistic construction and one that Sostratos included in his design of the second layer. Axiality refers to an imaginary line that divides a structure into symmetrical parts, which was evident in the Pharos.[94] Although constructing a lighthouse on Egyptian soil, Sostratos never failed to honor and promote Hellenistic culture in his architectural masterpiece.

The third and final level of the Pharos also maintained the axiality of the structure; Sostratos designed it as a cylinder. This final level reached twenty-six meters high and spanned nine meters in diameter. The height of the cylinder roughly completed a 2.5:1.5:1 relationship between the respective heights of each level, a ratio that began to be represented in ancient Alexandrian coins.[95] Additionally, this final level of the Pharos contained the fire and mirrors, critical to make the Pharos a lighthouse and not simply a fantastic structure guarding the entrance to Alexandria's harbors. The constant fire that marked Alexandria's location for weary travelers blazed within a basin or lantern. This lantern, twenty feet in diameter and ten feet deep, hung from stone arches tiled with basalt, chosen for its flame-resistant qualities.[96] Although large, the fire atop the Pharos could never have been large enough on its own to be seen as far as twenty-nine miles out to sea.[97] The mirrors assisted in sending the light out into the Mediterranean. This was accomplished by the reflections of both sunlight and firelight off of a large, concave, bronze mirror positioned in the center of the cylindrical shaft. Light reflected off this horizontally- positioned mirror up to another bronze, eight-sided, pyramidal mirror, which reflected the light out from the lighthouse, guiding in the ships.[98]

Sostratos successfully built the lighthouse in 19 years, completing the project under Ptolemy 1 Soter's son Philadelphus in 279 BC.[99] It reached 138 meters into the sky, an astonishing height in the ancient world.[100] Although unprecedented in size and scale, Sostratos' architectural masterpiece was also beautiful and functional. A set of internal steps spiraled up the building, wide enough for two men to climb simultaneously.[101] An open shaft allowed for fuel to be lifted from the ground level to just under the top. Most of the second, octagonal layer was designed for storage. Indeed, Sostratos designed the Pharos with varying numbers of rooms at different access points inside the lighthouse.[102] The exterior of the Pharos also contained a shaft running all the way to the top of the structure and operated by a rope and windlass.[103] Additionally, something of note on the outside of the Pharos was the inscription by Sostratos. Located near the top of the first level on the east side of the Pharos, the fifteen-inch letters described Sostratos as the architect.[104] Sostratos also covered this engraved inscription with a layer of plaster, hiding the fact that he promoted his own name above that of either Ptolemy.

Sostratos also included less functional elements in the Pharos. Artists sculpted the red-purple granite into statues to decorate the area around the lighthouse. The main entrance door, situated nearly twenty-five feet above the water, had a high, arched doorframe and ramp leading into the lighthouse.[105] The Pharos also contained four bronze tritons. These were aesthetically pleasing but also served a purpose unrelated to economics: one would be blown to alert of enemy approach and one was blown every hour as a method of keeping time.[106] Additionally, the Pharos sat over a cistern of clean water, brought to the island through the aqueduct of the Heptastadion. Supporting this cistern sat four glass and bronze crabs, so large that a man could sit between the claws.[107]

A final artistic addition to the Pharos was the statue that rested at the very top of the structure. This statue represented Isis, the goddess who invented sails and was widely considered the protector of ships.[108] The naked and beardless figure held a small object in one hand and a rowing oar in the other.[109] Isis' posture was one of action and progression to declare from the highest point in Alexandria that the city was a thriving and growing metropolis. Such extravagance indicated Sostratos' pride in his work and was reflected in the bill —the total construction cost of the Pharos reached over 800 talents of silver, equivalent to the weight of 800 men.[110]

In under two decades, Sostratos oversaw the building of a structure unprecedented in design, size, and function. The colossal height and unique layers of the Pharos set it apart from contemporary structures. Although earlier lighthouses may have existed, none reached the international fame and served as a model for countless others like the Pharos.[111] Sostratos' experience as both an architect and a diplomat uniquely prepared him to direct such a significant project. Indeed, Sostratos' employer, Ptolemy 1 Soter, recognized in him the characteristics of a man who would build a lighthouse that continued the vision established by Alexander the Great, a vision of a city both flourishing economically and leading the ancient world in scholarship and art.

REFERENCES

[1] Arrian, *The Anabasis of Alexander: Or, the History of the Wars and Conquests of Alexander the Great* (Forgotten Books, 2014), 140.

[2] Arrian, 140.

[3] Ibid., 141.

[4] Ibid., 141.

[5] P.M. Fraser, *Ptolemaic Alexandria* (Oxford, NY: Oxford University Press, 1972), 5.

[6] Fraser, 3.

[7] Kimberly Williams, *Alexandria and the Sea: Maritime Origins and Underwater Exploration* (Tampa, FL: Sharp Books International, 2004), 12.

[8] Thomas C. Clarie, *A lighthouse for Alexandria: Pharos, Ancient Wonder of the World* (Portsmouth, NH: Back Channel Press, 2008), 28.

[9] Clarie, 28.

[10] Fraser, 5.

[11] Strabo, *Geography*, trans. Horace Leonard Jones, Loeb Classical Library Online, 8, 1932, book 17, p.32.

[12] Arrian, 143.

[13] Clarie, 17.

[14] Arrian, 143.

[15] Fraser, 20.

[16] Clarie, 37.

[17] Strabo, 17.33.

[18] Fraser, 34.

[19] Ibid., 42.

[20] Fraser, 51.

[21] Clarie, 28.

[22] Ibid., 29.

[23] Strabo, 17.34.

[24] Clarie, 29.

[25] Strabo, 17.35.

[26] Diodorus, *The Library of History,* trans. by C. Bradford Welles. Loeb Classical Library Online 8, 1975, book 17, 52.5. Although most primary sources highlighting the economic importance of Alexandria appear near the turn of the century, the assumption that the city was filling this role 200 years earlier is not unfounded, according to Fraser, (133). In accordance with this, Strabo, near the turn of the century, notes that Alexandrian ports noticeably busy, even to the common man (Strabo, 17.31).

[27] Fraser, 133.

[28] Ibid., 133.

[29] Fraser, 138, 148.

[30] Williams, 26.

[31] Fraser, 57.

[32] Ibid., 152, 154.

[33] Williams, 56, 52.

[34] Clarie, 12.

[35] Williams, 41.

[36] Strabo, 17.31

[37] Ibid., 17.31

[38] Fraser, 147, 148.

[39] Ibid., 148.

[40] Williams, 45.

[41] Williams, 45.

[42] Fraser, 134, 150.

[43] Ibid., 134.

[44] Williams, 50.

[45] Fraser, 143.

[46] Williams, 46.

[47] Fraser, 149.

[48] Ibid., 149.

[49] Williams, 45.

[50] Ibid., 45.

[51] Ibid., 49.

[52] Williams, 49.

[53] Williams, 55.

[54] Ibid., 55.

[55] Strabo, 17.25.

[56] Ibid., 17.25.

[57] Ibid., 17.25.

[58] Williams, 55.

[59] Clarie, 11.

[60] Strabo, 17.26.

[61] Williams, 56.

[62] P.M. Fraser, "The ΔΙΟΛΚΟΣ of Alexandria" *The Journal of Egyptian Archaeology* 47 (December, 1961), 137.

[63] Clarie, 12.

[64] Strabo, 17.26.

[65] Strabo, 17.25.

[66] Clarie, 8.

[67] Ibid., 25.

[68] Alexander Meeus, "The Career of Sostratos of Knidos: Politics, Diplomacy, and the Alexandrian Building Programme in the Early Hellenistic Period" in *Greece, Macedon and Persia: Studies in Social, Political and Military History in Honour of Waldemar Heckel* ed. by Timothy Howe, E. Edward Garvin, and Graham Wrightson, 143-171 (Oxford, UK: Oxbow Books, 2015), 143. Meeus engages in a robust debate with other authors in his defense of Sostratos as the architect, including P.M. Fraser and other experts. Meeus' argument centers around the necessity of using what the existing primary sources provide. Fraser's argument requires the disregard of Sostratos' motivation in his somewhat manipulative inscription on the side of the Pharos, a step that Meeus is unwilling to take without evidence from primary sources. Also, Fraser and other experts claim the lack of primary sources before Pliny (23 AD - 79 AD) as grounds for disregarding the primary accounts that submit Sostratos as the architect. Meeus rejects this theory because of the logical implications of disregarding primary sources that span centuries from their topic — the consistent application of such rejection would be devastating to historical study in any subject. Meeus concludes that the lack of concrete evidence does not discount the available evidence provided by the primary sources and that Sostratos should be considered the architect as a result.

[69] Meeus, 158, 161. Meeus notes that the significance of Sostratos' mission to Athens in 287 indicates that he was a seasoned diplomat by this date.

[70] Clarie, 48.

[71] Ibid., 47.

[72] Meeus, 165.

[73] Lucian, *Hippias*, trans. A.M. Harmon, Attalus, 2014, 2.

[74] Meeus, 147.

[75] Ibid., 165.

[76] Charles Walker, *Wonders of the Ancient World* (Gallery Books, 1989), 16.

[77] Clarie, 40.

[78] Clarie, 40

[79] Fraser, 51.

[80] William L. McDonald, *The Architecture of the Roman Empire,* vol. 1, *An Introductory Study* (Yale University Press, 1982),

[81] McDonald, 142.

[82] Clarie, 59.

[83] Patrick Beaver, *A History of Lighthouses,* 11.

[84] Clarie, 60.

[85] Ibid, 37. Identifying the exact beginning date of construction on the Pharos is difficult — no primary sources provide that information directly. However, a comparison of the timelines of other building projects of this magnitude point to the construction of the Pharos taking at least two decades to complete. That information matched with Posidippus' epigram (EP. 115.1) — written to celebrate

the completion of the Pharos in a time contemporary with Pyrrhus (297-272 BC) — and other, later sources (Fakharani, 272) point to the earliest construction beginning around the turn of the century.

[86] Fraser , “The ΔΙΟΛΚΟΣ of Alexandria,” 18.

[87] Kenneth Sutton-Jones, *Pharos: The Lighthouse Yesterday Today and Tomorrow,* Michael Russell Publishing Inc., 1985, 415. Sources vary on the exact size of this platform but most estimates hover around 110 meters squared by 7 meters high.

[88] Fawzi El Fakharani, “The Lighthouse’ of Abusir in Egypt” *Harvard Studies in Classical Philology* 78 (1974), 269.

[89] Fakharani, 269.

[90] Walker, 17.

[91] Fakharani, 415. Although the details of size differ slightly, nearly every account concludes that the first layer of the Pharos was in the form of a rectangle standing on one end.

[92] Beaver, 30.

[93] Sutton-Jones, 415.

[94] W.H. Davenport Adams, *Temples, Tombs, and Monuments of Ancient Greece and Rome: A description and a history of some of the most remarkable memorials of classical architecture* (London: T. Nelson and Sons, 1871), 214.

[95] Clarie, 58.

[96] Clarie, 67

[97] Ibid., 51.

[98] Clarie, 71.

[99] Fakharani, 272. Again, exact dating is difficult for the completion of the Pharos. Nevertheless, most sources converge around 280 BC.

[100] Walker, 17. As with nearly every other exact measurement or date regarding the Pharos, historians contest each figure, some citing outrageous heights as great as 400 meters. Nevertheless, the general consensus of reliable sources centers around 138 meters high.

[101] Doris Behrens-Abouseif, “The Islamic History of the Lighthouse of Alexandria” *Muqarnas* 23 (2006), 3.

[102] Behrens-Abouseif, 6. Scholars debate the exact number of rooms still today —the most reliable sources are Arabic writers from 1100 AD, most likely writing after the initial destruction and reconstruction of the lighthouse. Estimates for the original numbers vary between fifty and 300.

[103] Clarie, 61.

[104] Ibid., 45.

[105] Clarie, 60.

[106] Clarie, 65.

[107] Ibid., 63.

[108] Susan Handler, “Architecture on the Roman Coins of Alexandria,” *American Journal of Archaeology* 75 no. 1 (January, 1971), 75. Again, historians cannot agree on the original subject of Sostratos’ statue. Without conclusive evidence, historians are left to lean on ancient coins, the fact that a cult center or temple seemed to also be situated on the island of Pharos (Fraser, 20), and the recent discovery of a very large statue of Isis in the harbor of Alexandria.

[109] Handler, 75.

[110] Pliny, *Natural History,* 36.17.

[111] Sutton-Jones, 3.

Der Leuchtthurm bei Alexandria.

C H A P T E R IX

Weapons at the Light House

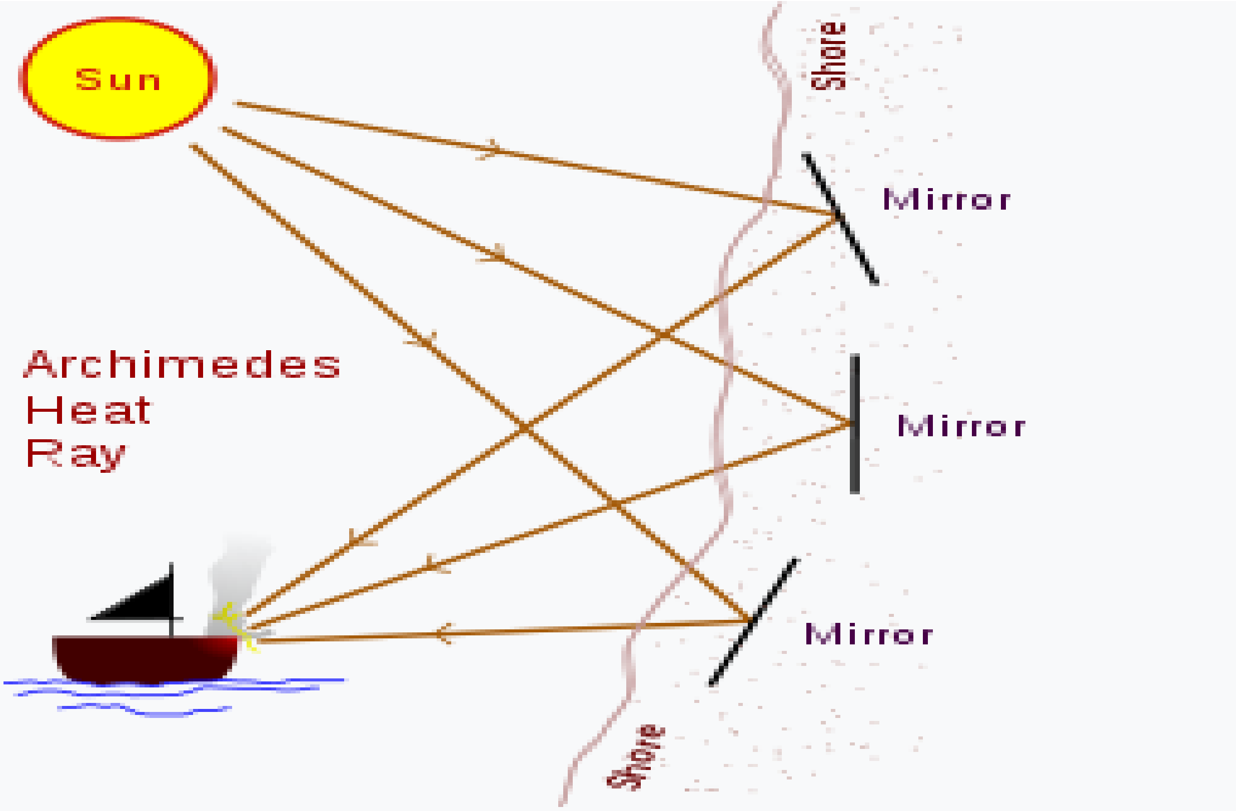
Archimedes of Syracuse ;(c. 287 – c. 212 BC) was a Greek mathematician, physicist, engineer, inventor, and astronomer. Although few details of his life are known, he is regarded as one of the leading scientists in classical antiquity. Generally considered the greatest mathematician of antiquity and one of the greatest of all time,[4][5][6][7][8][9] Archimedes anticipated modern calculus and analysis by applying concepts of infinitesimals and the method of exhaustion to derive and rigorously prove a range of geometrical theorems, including the area of a circle, the surface area and volume of a sphere, and the area under a parabola.

Other mathematical achievements include deriving an accurate approximation of pi, defining and investigating the spiral bearing his name, and creating a system using exponentiation for expressing very large numbers. He was also one of the first to apply mathematics to physical phenomena, founding hydrostatics and statics, including an explanation of the principle of the lever. He is credited with designing innovative machines, such as his screw pump, compound pulleys, and defensive war machines to protect his native Syracuse from invasion.

Archimedes died during the Siege of Syracuse when he was killed by a Roman soldier despite orders that he should not be harmed. Cicero describes visiting the tomb of Archimedes, which was surmounted by a sphere and a cylinder, which Archimedes had requested be placed on his tomb to represent his mathematical discoveries.

Weapons of Sunlight: The 2nd century AD author Lucian wrote that during the Siege of Syracuse Archimedes destroyed enemy ships with fire. The device, sometimes called the Archimedes heat ray, was used to focus sunlight onto approaching ships, causing them to catch fire. This weapon has been the subject of ongoing debate about its credibility since the Renaissance. It has been suggested that a large array of highly polished bronze or copper shields acting as mirrors could have been employed to focus sunlight onto a ship. This would have used the principle of the parabolic reflector in a manner similar to a solar furnace. Archimedes of Syracuse (287-212 BC) was a Greek mathematician, physicist, engineer, inventor, and astronomer. Among his advances in physics are the foundations of hydrostatics, statics and an explanation of the principle of the lever. He is credited with designing innovative machines, including siege engines and the screw pump that bears his name

Heat ray

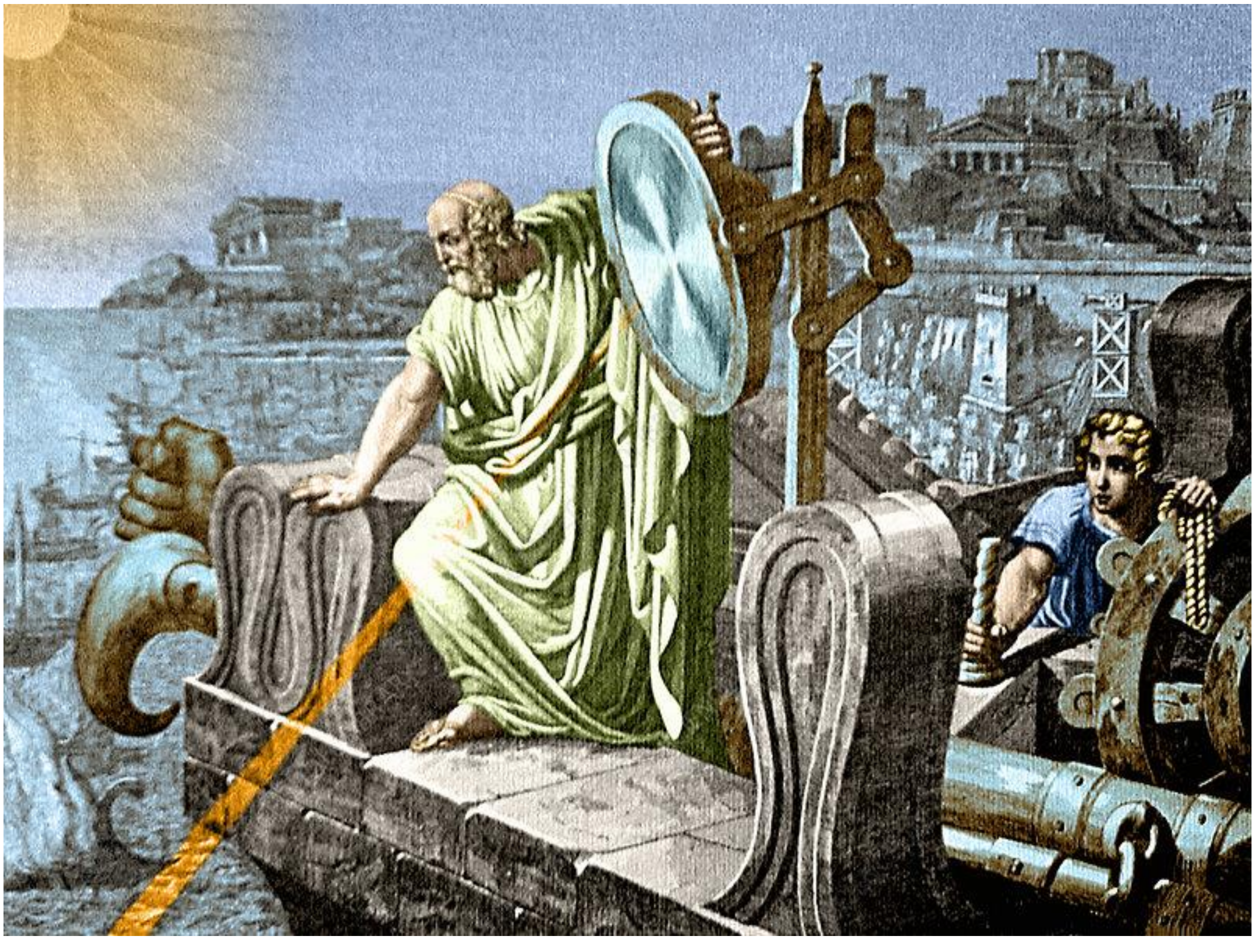


Archimedes may have used mirrors acting collectively as a parabolic reflector to burn ships attacking Syracuse.

Artistic interpretation of Archimedes' mirror used to burn Roman ships. Painting by Giulio Parigi, c. 1599

Archimedes may have used mirrors acting collectively as a parabolic reflector to burn ships attacking Syracuse. The 2nd century AD author Lucian wrote that during the Siege of Syracuse (c. 214–212 BC), Archimedes destroyed enemy ships with fire. Centuries later, Anthemius of Tralles mentions burning-glasses as Archimedes' weapon. The device, sometimes called the "Archimedes heat ray", was used to focus sunlight onto approaching ships, causing them to catch fire. In the modern era, similar devices have been constructed and may be referred to as a heliostat or solar furnace.

This purported weapon has been the subject of ongoing debate about its credibility since the Renaissance. René Descartes rejected it as false, while modern researchers have attempted to recreate the effect using only the means that would have been available to Archimedes. It has been suggested that a large array of highly polished bronze or copper shields acting as mirrors could have been employed to focus sunlight onto a ship.

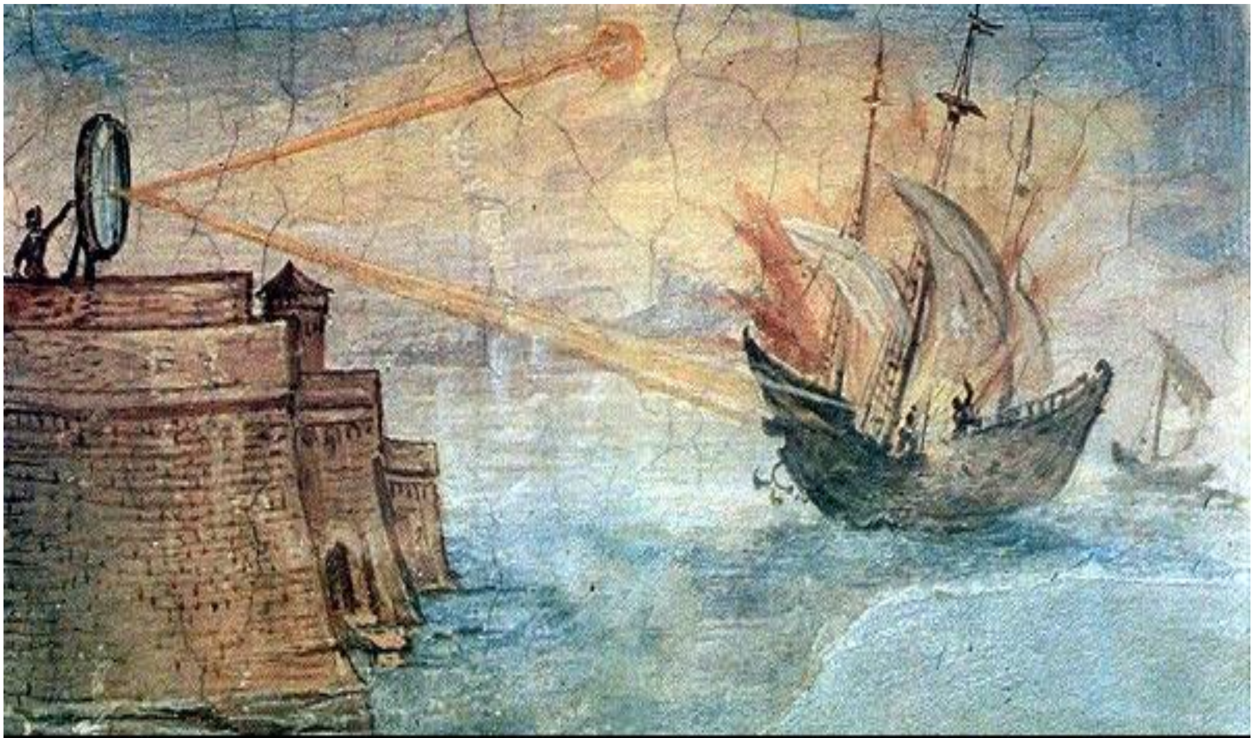


A test of the Archimedes heat ray was carried out in 1973 by the Greek scientist Ioannis Sakkas. The experiment took place at the Skaramagas naval base outside Athens. On this occasion 70 mirrors were used, each with a copper coating and a size of around five by three feet (1.5 by 1 m). The mirrors were pointed at a plywood mock-up of a Roman warship at a distance of around 160 feet (50 m). When the mirrors were focused accurately, the ship burst into flames within a few seconds. The plywood ship had a coating of tar paint, which may have aided combustion. A coating of tar would have been commonplace on ships in the classical era.

In October 2005 a group of students from the Massachusetts Institute of Technology carried out an experiment with 127 one-foot (30 cm) square mirror tiles, focused on a mock-up wooden ship at a range of around 100 feet (30 m). Flames broke out on a patch of the ship, but only after the sky had been cloudless and the ship had remained stationary for around ten minutes. It was concluded that the device was a feasible weapon under these conditions. The MIT group repeated the experiment for the television show *MythBusters*, using a wooden fishing boat in San Francisco as the target. Again some charring occurred, along with a small amount of flame. In order to catch fire, wood needs to reach its autoignition temperature, which is around 300 °C (570 °F).

When *MythBusters* broadcast the result of the San Francisco experiment in January 2006, the claim was placed in the category of "busted" (or failed) because of the length of time and the ideal weather conditions required for combustion to occur. It was also pointed out that since Syracuse faces the sea towards the east, the Roman fleet would have had to attack during the morning for optimal gathering of light by the mirrors. *MythBusters* also pointed out that conventional weaponry, such as flaming arrows or bolts from a catapult, would have been a far easier way of setting a ship on fire at short distances.

In December 2010, *MythBusters* again looked at the heat ray story in a special edition entitled "President's Challenge". Several experiments were carried out, including a large scale test with 500 schoolchildren aiming mirrors at a mock-up of a Roman sailing ship 400 feet (120 m) away. In all of the experiments, the sail failed to reach the 210 °C (410 °F) required to catch fire, and the verdict was again "busted". The show concluded that a more likely effect of the mirrors would have been blinding, dazzling, or distracting the crew of the ship.



Archimedes' mirror burning Roman military ships - Giulio Parigi - 1600 - Uffizi Gallery, Florence

Other discoveries and inventions

While Archimedes did not invent the lever, he gave an explanation of the principle involved in his work *On the Equilibrium of Planes*. Earlier descriptions of the lever are found in the Peripatetic school of the followers of Aristotle, and are sometimes attributed to Archytas. According to Pappus of Alexandria, Archimedes' work on levers caused him to remark: "Give me a place to stand on, and I will move the Earth."Plutarch describes how Archimedes designed block-and-tackle pulley systems, allowing sailors to use the principle of leverage to lift objects that would otherwise have been too heavy to move.[49] Archimedes has also been credited with improving the power and accuracy of the catapult, and with inventing the odometer during the First Punic War. The odometer was described as a cart with a gear mechanism that dropped a ball into a container after each mile traveled.

Cicero (106–43 BC) mentions Archimedes briefly in his dialogue *De re publica*, which portrays a fictional conversation taking place in 129 BC. After the capture of Syracuse c. 212 BC, General Marcus Claudius Marcellus is said to have taken back to Rome two mechanisms, constructed by Archimedes and used as aids in astronomy, which showed the motion of the Sun, Moon and five planets. Cicero mentions similar mechanisms designed by Thales of Miletus and Eudoxus of Cnidus. The dialogue says that

Marcellus kept one of the devices as his only personal loot from Syracuse, and donated the other to the Temple of Virtue in Rome. Marcellus' mechanism was demonstrated, according to Cicero, by Gaius Sulpicius Gallus to Lucius Furius Philus, who described it thus:

Hanc sphaeram Gallus cum moveret, fiebat ut soli luna totidem conversionibus in aere illo quot diebus in ipso caelo succederet, ex quo et in caelo sphaera solis fieret eadem illa defectio, et incideret luna tum in eam metam quae esset umbra terrae, cum sol e regione.

When Gallus moved the globe, it happened that the Moon followed the Sun by as many turns on that bronze contrivance as in the sky itself, from which also in the sky the Sun's globe became to have that same eclipse, and the Moon came then to that position which was its shadow on the Earth, when the Sun was in line.

This is a description of a planetarium or orrery. Pappus of Alexandria stated that Archimedes had written a manuscript (now lost) on the construction of these mechanisms entitled *On Sphere-Making*. Modern research in this area has been focused on the Antikythera mechanism, another device built c. 100 BC that was probably designed for the same purpose. Constructing mechanisms of this kind would have required a sophisticated knowledge of differential gearing. This was once thought to have been beyond the range of the technology available in ancient times, but the discovery of the Antikythera mechanism in 1902 has confirmed that devices of this kind were known to the ancient Greeks.

Claw of Archimedes

The Claw of Archimedes is a weapon that he is said to have designed in order to defend the city of Syracuse. Also known as "the ship shaker", the claw consisted of a crane-like arm from which a large metal grappling hook was suspended. When the claw was dropped onto an attacking ship the arm would swing upwards, lifting the ship out of the water and possibly sinking it. There have been modern experiments to test the feasibility of the claw, and in 2005 a television documentary entitled *Superweapons of the Ancient World* built a version of the claw and concluded that it was a workable device.

Archimedes and the Burning Mirror

No other tale has raised as much controversy as the story of the Greek inventor Archimedes using a giant mirror, or set of mirrors, to set fire to Roman ships attacking his home city of Syracuse in 212 B.C.. Did it actually happen? Scientists and scholars have come down on each side of this question. Sometimes their conclusions are based on the historical record (or lack of it), sometimes the researchers have actually tried setting up the test themselves using real mirrors and mock ships. In 2010, U.S. President Obama even challenged the hosts of the TV show *Mythbusters* to test the problem and come to a definitive conclusion. They did, but was their answer the correct one?

Let's start our exploration of the subject by going back to an account of what Archimedes supposedly did. Zonares and Tzetzes writing in the 12th century quoted from an earlier work (now lost) called the *Siege of Syracuse*, said:

When Marcellus [The Roman General] had placed the ships a bow shot off, the old man [Archimedes] constructed a sort of hexagonal mirror. He placed at proper distances from the mirror other smaller mirrors of the same kind, which were moved by means of their hinges and certain plates of metal. He placed it amid the rays of the sun at noon, both in summer and winter. The rays being reflected by this, a frightful fiery kindling was excited on the ships, and it reduced them to ashes, from the distance of a bow shot. Thus the old man baffled Marcellus, by means of his inventions.

It is clear that, at least on the surface, the method described seems plausible. Plenty of school children have used a magnifying glass to concentrate the sun's rays onto a small piece of wood, setting it on fire. The same thing can be done with a small parabolic mirror which can take the sun's rays and reflect them onto a small point. The writers suggest that Archimedes did this on a grand scale with a huge mirror focusing it on ships anchored "a bow shot" from the wall of the city (perhaps 500 feet).

The ability of mirrors to concentrate the sun to obtain very high temperatures is well-known. A few years ago the U.S. Department of Energy, along with a group of businesses, constructed a solar "power tower" station in the Mojave Desert near Barstow, California, to demonstrate the feasibility of harnessing this kind of energy. The station consisted of an array of mirrors that reflected the sun to a tower in the center of the field. At the top of this tower was a large target that used molten salt to absorb the heat and transfer it to a water boiler on the ground. The boiler created steam which then ran turbines and generators like a regular power plant to make electricity. The plant could produce 10 megawatts by using almost 2000 mirrors that would move under computer control, tracking the sun and reflecting its light to the tower.

The Solar II power plant near Barstow, CA, used almost 2000 mirrors and the heat of the sun to make 10 megawatts of power.

It's easy to imagine focusing those mirrors on a wooden ship instead of the tower and setting it ablaze. The target at the top of the tower can reach temperatures greater than 1,000 Fahrenheit, well about the autoignition point of most wood. However, each of the installation's mirrors was huge (430 square feet- which is a mirror over twenty feet long by twenty feet wide) and there were almost 2000 of them, probably not something Archimedes could have arranged given the technology at the time.

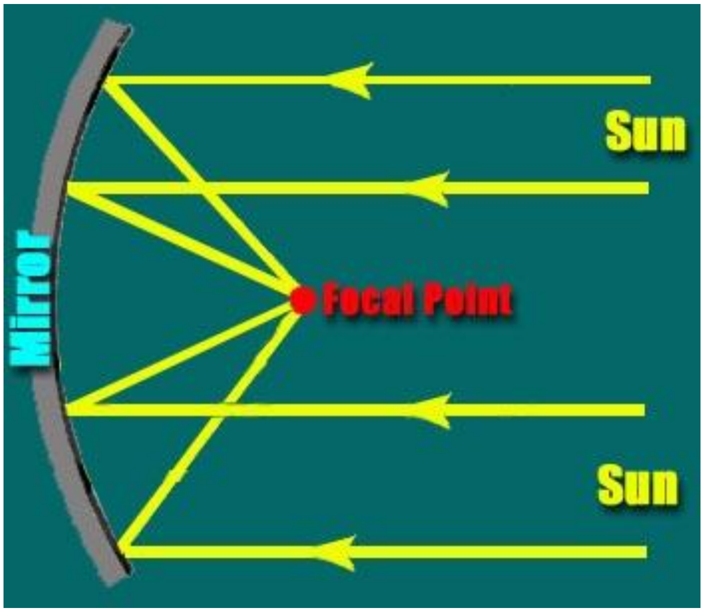
So the question isn't whether the sun could provide enough heat, it is whether Archimedes could have built a mechanism with the tools he had available at the time to concentrate enough sunlight to set the deck of a wooden ship on fire.

A Parabolic Mirror

Many illustrators have pictured the old inventor using a single parabolic mirror a few feet in diameter to do the job. A parabolic mirror has a curved shape that will focus parallel light rays coming from a light source (like the sun) onto a single point (called the focal point) which is a set distance from the mirror (the focal length).

The problem with this scheme is that a single, solid mirror has a set focal length. This means that the ship you want to set to fire must be precisely the focal distance away from your mirror for such a scheme to work. Any closer or farther and the light isn't concentrated on a small point, but is instead spread out over a larger area. This in turn means that the resulting temperature will probably not be high enough to start combustion.

Since Archimedes couldn't control how far away Marcellus parked his ships, he couldn't anticipate where to set the focal point when he built his mirror. One way to get around this problem is to build such a large mirror that even if the focus point isn't precisely on the ship you still concentrate enough light on it to get it burning. The problem with this is that a single mirror the necessary size would be extremely hard to move and control with the primitive equipment Archimedes had.



Another problem with a large parabolic mirror is that the farther the focal point is away from the mirror, the less energy you can focus on it. For example, a one foot diameter parabolic mirror with a ten foot focal length can concentrate light from the sun by 10 times. However, a one foot diameter parabolic mirror with a one hundred foot long focal length would not concentrate sunlight at all. If the Roman ships were any distance from the mirror, say 500 feet, Archimedes would need a parabolic mirror at least 10 feet in diameter to just double the normal heat that the target would get from the sun itself. This would be far less than what would be needed to get a fire going.

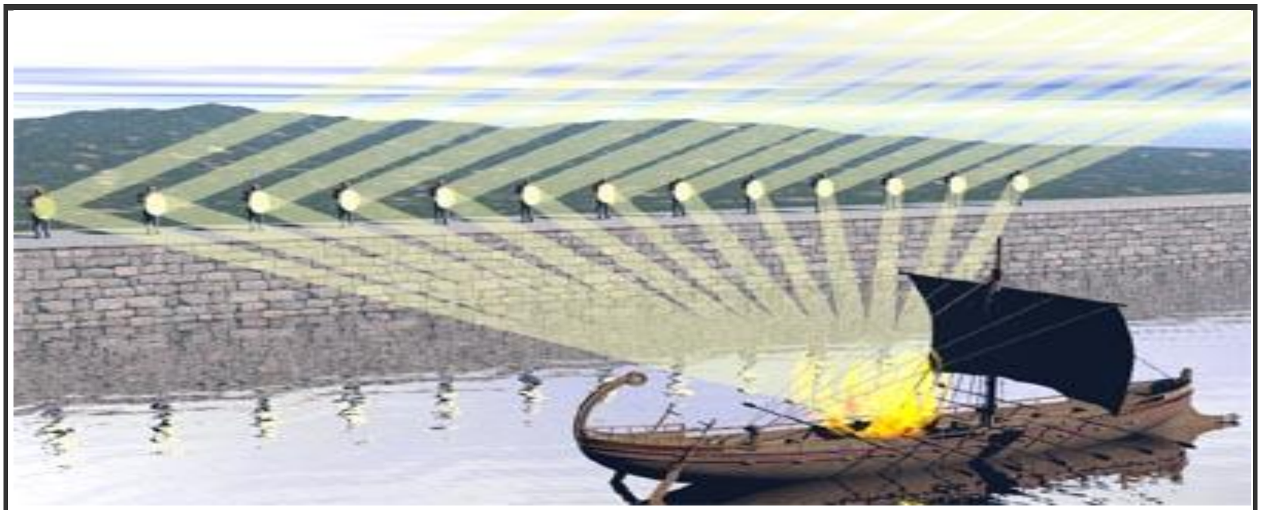
Multiple Mirrors

All this seems to make it much more likely that Archimedes instead used a number of small, flat mirrors instead of one, big, parabolic one. Each of the mirrors could be used to focus sunlight to a small spot on the target. Together they would form a shape roughly the same as one huge parabolic mirror. To do this he might have equipped hundreds of soldiers with mirrors. Working together, with each man adjusting his own mirror, they might have been able to focus enough light on a single point on a ship to get it burning.

This approach is exactly what a number of attempts to reproduce Archimedes achievement have used. Apparently in 1973 a Greek scientist, Dr. Ioannis Sakkas, became curious about whether Archimedes could really have used a "burning glass" to destroy the Roman fleet and set up an experiment involving 60 Greek sailors each using an oblong 3' by 5' flat mirror to focus light on a wooden rowboat 160 feet away. According to sources he had no problem getting the wood to catch fire very quickly.

In 2009, as an exercise in design, a class at MIT decided to try and reproduce the Archimedes weapon using 127 one foot by one foot mirrors. They were successful in getting a mocked up ship made out of red oak to start burning after ten minutes of exposure to direct sun. Their experience, however, showed some flaws with the idea of using this as a weapon.

The problem with using individual mirrors is that each of them has to be aimed at the target (a specific point on the ship) at their own particular angle from the sun. If you handed one person a mirror and asked him to reflect the sunlight to a location, it is easy for him to do. He simply uses the bright spot formed by the mirror's reflection as a guide to aiming at the target. If you give one-hundred people mirrors and try to do the same thing, however, you have chaos. One hundred mirrors means one hundred bright spots and nobody is sure which spot is theirs.



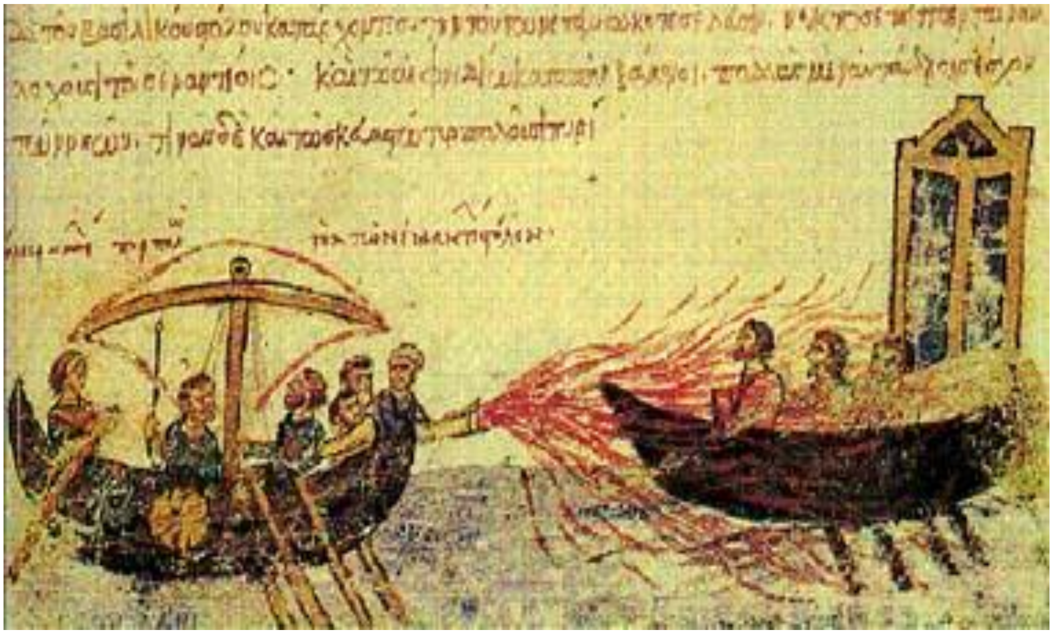
Soldiers using multiple flat mirrors could concentrate light on a ship, but could they really get it hot enough to burst into flame? *(Copyright Lee Krystek, 2011)*

use of an aiming device this problem can be minimized. A more difficult problem to solve is the length of time needed by the MIT crew to get a fire going. Ten minutes is a long time to keep your attention ocused on aiming a mirror at distant point while the chaos of battle is going on around you. Plus the length of time necessary to get anything burning could easily be stretched out even further if the enemy took the simple defensive measure of splashing water on your target area to cool it down.

In 2010 the *Mythbusters* television show attempted use 500 flat mirrors controlled by 500 volunteer middle and high school students to reproduce the burning mirror legend. Despite an hour of focusing the sun on a sail (which should have had an ignition point of only about 500 degrees Fahrenheit) they could only get the temperature up to about 230 degrees. Even more significant is that they used modern silver mirrors do this. Polished bronze mirrors, more typical of what would have been available in Archimedes day, would have been 30 percent less efficient, resulting in a lower temperature.

The *Mythbusters* conclusion was that although in theory setting a ship on fire with mirrors might be possible, it seems an unlikely method to be used in battle. Jamie Hyneman, one of the *Mythbusters* hosts who was stationed aboard the mock ship during the experiment, observed that while the ship did not burst into flame he found the dazzling brightness of the mirrors disconcerting and suggested that Archimedes might have simply used them to confuse the enemy and disrupt their ability to see their opponents.

Others have suggested that while the mirrors might not have been able to set the ships on fire, they might have been very effective in harassing the crew of the ship. Having a light beam focused on you that could raise your skin temperature to over 200 degrees would be extremely unpleasant.



Greek fire was thought to be a form of sticky petroleum that would be set on fire. It could be delivered in a jug, or sprayed on with a siphon as shown here.

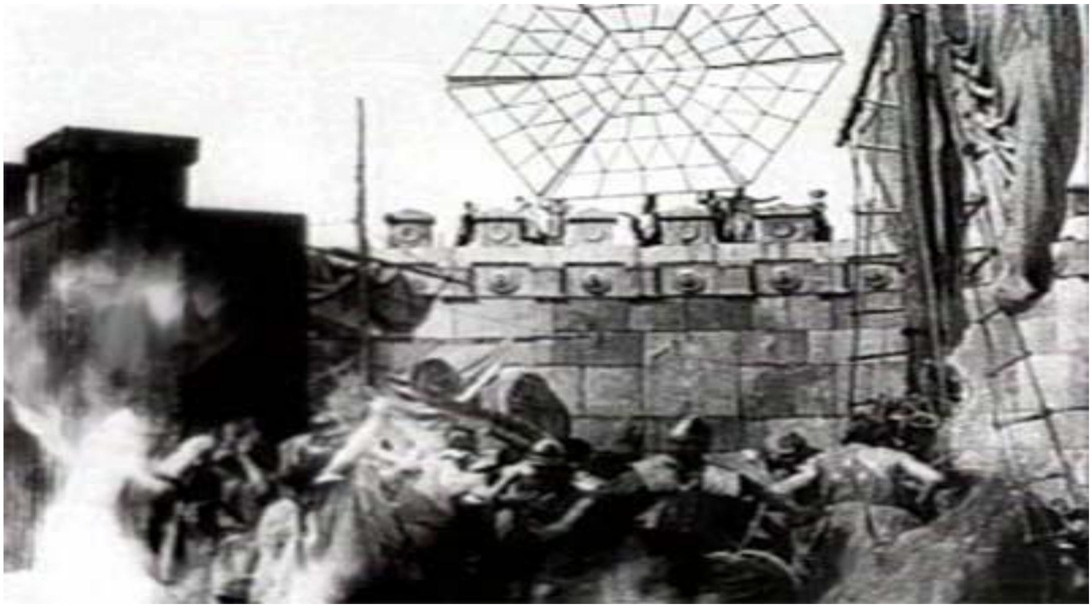
Given that it seems that mirrors are an impractical way to set a ship on fire, perhaps it makes sense to look at the accuracy of documents that claim that Archimedes actually did this. The quote we looked at earlier was written 1,400 years after the fact. It says that it is quoting an earlier work, but that early work is now lost so we can't really see the source material itself.

Writers contemporary to the era, like Polybius, Livy, and Plutarch, never mention the use of mirrors to set ships on fire, though they do discuss other of Archimedes defensive devices. In particular they tell about "The Claw of Archimedes" which was apparently a crane that stuck out far over the city wall and would use a grappling hook to catch the Roman ships, lift them and overturn them.

Two second century A.D. writers, Lucian of Samosata and Galen of Pergamon, do say that Archimedes set fire to the Roman ships, but don't say exactly how. This has led to speculation that the inventor may have employed a different method than mirrors: Greek fire.

Greek Fire?

Exactly what Greek fire was is a bit of a mystery to historians today. Sources tell us it would burn on water and some sources even tell us it would be ignited by water. A number of researchers, however, suspect that Greek fire was actually a thick, sticky form of petroleum. While such a material wouldn't actually burst into flame on contact with water, neither would water work as a particularly effective extinguishing agent, and might actually spread the flames. The easiest form of delivery would have been a pot filled with the stuff that has a lit wick sticking out of the top. When cast onto a ship, the pot would break open spilling out the liquid which would be set on fire by the flame. The arrangement would act precisely like an ancient version of a molotov cocktail.

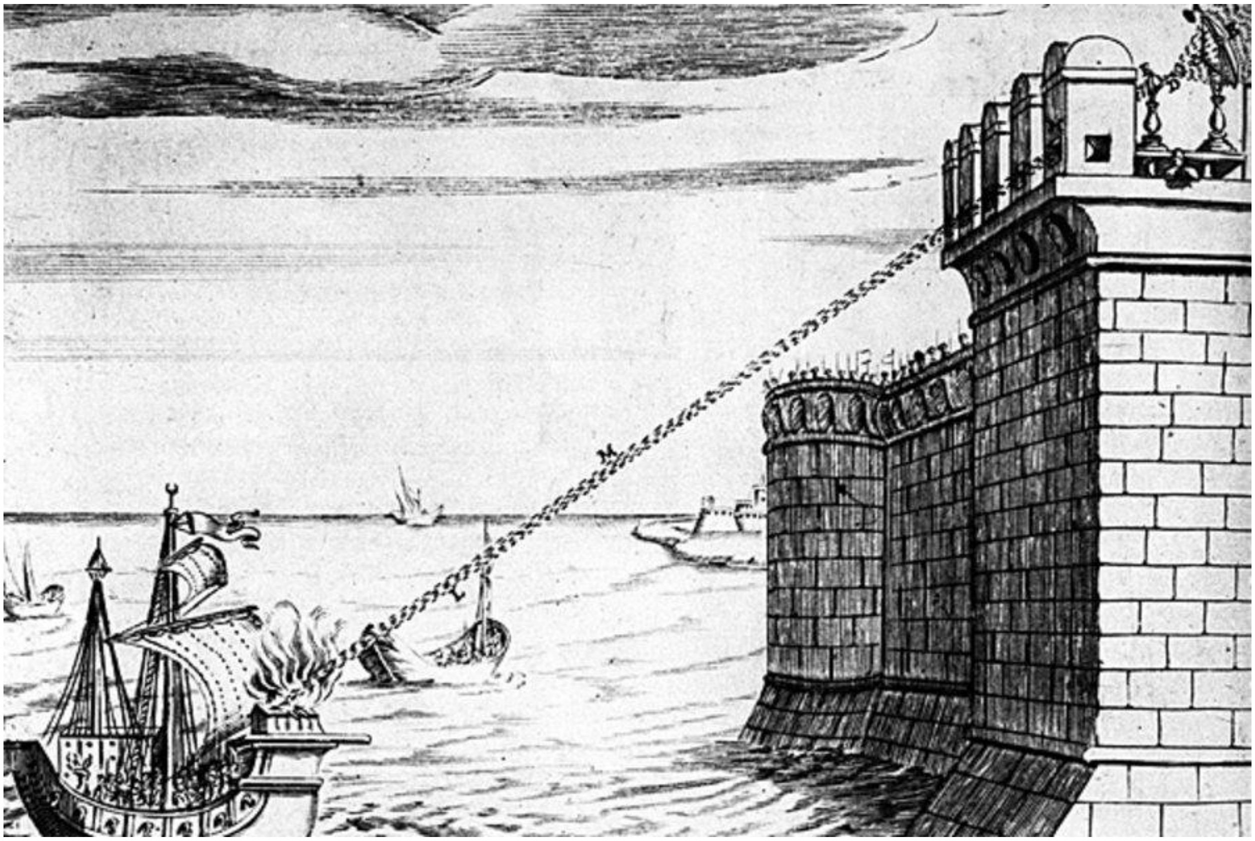


Archimedes sets fire to a ship using a huge mirror made up of many flat segments in this silent film from 1914.

Another of Archimedes defensive designs supposedly deployed during the battle was a form of catapult. It would be easy to envision one of these machines pelting the Roman ships with pots of Greek fire and reducing them to ashes. If at the same time Archimedes was also employing mirrors to confuse and blind the enemy, an observer of the battle might be confused about what had caused the fires.

So did Archimedes set ships on fire at the Siege of Syracuse? We may never be sure of the truth. He certainly could have attempted it, though many of the facts we have today seem to suggest he might have not been as successful as the legend says. The history of the era probably supports this conclusion. If the

Romans had found burning mirrors an effective defense during the battle, there is little doubt that they would have figured out how to add such a weapon to their own arsenal, which they never did.



Fiery cannonballs: Greek inventor Archimedes is said to have used mirrors to burn ships of an attacking Roman fleet. But new research suggests he may have used steam cannons and fiery cannonballs instead.

A legend begun in the Medieval Ages tells of how Archimedes used mirrors to concentrate sunlight as a defensive weapon during the siege of Syracuse, then a Greek colony on the island of Sicily, from 214 to 212 B.C. No contemporary Roman or Greek accounts tell of such a mirror device, however.

Both engineering calculations and historical evidence support use of steam cannons as "much more reasonable than the use of burning mirrors," said Cesare Rossi, a mechanical engineer at the University of Naples "Federico II," in Naples, Italy, who along with colleagues analyzed evidence of both potential weapons.

The steam cannons could have fired hollow balls made of clay and filled with something similar to an incendiary chemical mixture known as Greek fire in order to set Roman ships ablaze. A heated cannon barrel would have converted barely more than a tenth of a cup of water (30 grams) into enough steam to hurl the projectiles.

Channeling steam power

Italian inventor Leonardo da Vinci sketched a steam cannon in the late 15th century, which he credited to Archimedes, and several other historical accounts mention the device in connection with Archimedes.

Indirect evidence for the steam cannon also comes from the Greek-Roman historian Plutarch, who tells of a pole-shaped device that forced besieging Roman soldiers to flee at one point from the walls of Syracuse. The Greek-Roman physician and philosopher Galen similarly mentioned a burning device used against the Roman ships, but used words that Rossi said cannot translate into "burning mirror."

Rossi calculated that such cannons could have fired a cannonball weighing roughly 13 pounds (6 kilograms) at speeds of roughly 134 miles per hour (60 meters per second). That allowed the cannons to possibly target troops or ships at distances of approximately 492 feet (150 m) while firing at a fairly flat trajectory to make aiming easier.

"As far as I know, it is the first paper about that use of a steam cannon by Archimedes," Rossi told LiveScience.

Past investigations by Greek engineer Joannis Stakas and Evanghelos *Stamatis*, a historian, showed that a parabolic mirror can set small, stationary wooden ships on fire. MIT researchers carried out a similar demonstration more than three decades later in 2005.

But whether mirrors could have maintained a constantly changing curvature to keep the right burning focus on moving ships seems doubtful, Rossi noted. He added that ancient sailors could have easily put out any fires that started from a slow-burning mirror.

By contrast, Greek fire emerged in many historical accounts as a deadly threat for ancient warships. The unknown chemical mixture reportedly burned underwater, and saw most use by the Byzantine Empire that dominated the Eastern Mediterranean starting in A.D. 330. Other records mention earlier versions of the burning mixture.

Recreating the past

The steam cannons only represent the latest historical investigation by Rossi. He previously coauthored the book "Ancient Engineers’ Inventions: Precursors of the Present" (Springer, 2009), along with military historians Flavio Russo and Ferruccio Russo.

The trio plan to meet up with other historians in the future and possibly reconstruct versions of the ancient weapons. Flavio previously built several working reconstructions of ancient Roman artillery weapons, and Ferruccio specializes in 3-D virtual reconstructions of mechanical devices.

Some of Rossi's other work looked at ancient motors that may have moved siege towers used by the Greeks and Romans. The likeliest motors may have relied on counterweights, and emerged in records as the invention of Heron of Alexandria in the first century.

Such devices could have been placed inside the protection of the towers themselves, Rossi noted. He pointed to an account by the Roman general Julius Caesar, who told of using such towers against a town defended by Gallic tribes in modern-day France. The sight of towers appearing to move by themselves frightened the defenders into negotiating for surrender.

A research paper on the siege towers was presented alongside Rossi's recent work entitled "Archimedes' Cannons against the Roman Fleet?" at the International World Conference held in Syracuse, Italy from June 8-10. The conference proceedings appear in a book titled "The Genius of Archimedes -- 23 Centuries of Influence on Mathematics, Science and Engineering" (Springer, 2010).

In the end, the engineering talents of Archimedes did not save him from death when the Romans finally stormed Syracuse. But at least a love of history among Rossi and his colleagues may lead to the resurrection of some of his ancient devices.[2]

I'm sure that many of us must have burnt a piece of paper at least once in our lives by focusing sunlight through a lens on a specific spot. The feeling of seeing the first hints of a black spot appear on the paper is bizarre, but very satisfying! After succeeding in burning a small piece of paper, many people have even tried to burn comparatively larger things by using the same principle, but found little or no success.

However, rest assured, many others have tried to do the exact same thing. In fact, legend has it that Archimedes, the famous Greek scientist and mathematician, also thought of causing destruction using the same principle, only on an exponentially bigger scale. It's said that he created a 'death ray' by focusing sunlight through a large number of mirrors (or a single enormous mirror) onto Roman ships that were attempting to invade Greece. Legend has it that he burnt down those enemy ships using the death ray and sent the enemy army into complete disarray.

However, for this post, we're not particularly interested in the latter part of the legend; rather, we would like to know if Archimedes ever actually built such a formidable 'death ray'. More importantly, is it actually possible to burn ships by focusing sunlight on them through mirror(s)?

A Mirror's 'Burning' Potential

How a magnifying glass burns a piece of paper

Let’s return to our little ‘paper-burning’ experiment using a small lens. Sunlight, or light rays coming from the sun, carry a specific amount of energy. Under normal conditions, sunlight doesn’t cause paper to light on fire because the light rays are diffused, or too far away from each other to be able to make any significant visible impact on the paper.

However, when you position a magnifying glass between the piece of paper and the light rays coming toward it, you essentially cause those rays to come closer together and converge onto a specific spot (called a ‘focal point’), which first turns black, and then, sometimes quite dramatically, bursts into flames!Can the same principle be used to burn something bigger, say, a ship?

Theoretically, yes… you CAN burn larger stuff (only things that *can* be burned, that is) using this principle, which means that there is some theoretical basis to Archimedes’ ship-burning legend.

That being said, in a real-life situation, it’s difficult enough to smolder a piece of wood, let alone set a huge ship ablaze! There are some practically insurmountable difficulties in burning a ship using this technique. Let’s take a look at a few:

Size of the Mirror

The first thing that would have upset Archimedes must have been the need to have a mirror; and a huge one at that! You see, it’s easy to burn a hole in a flimsy piece of paper with a small magnifying glass, but when it comes to burning a life-sized ship from a considerable distance, or even cause the tiniest of flames, you would need an impractically huge mirror.

Let’s suppose, for the sake of argument, that Archimedes had access to such a huge mirror. He would then have to figure out a way to transport, maneuver and point it precisely at the target without significant difficulty and as swiftly as possible. On top of that, Archimedes surely wouldn’t want to crack or dent the mirror even a little bit while moving it, would he?

Using a Cluster of Mirrors?

Let’s assume that Archimedes used a cluster of smaller mirrors, rather than using one giant mirror. Now, is there anything wrong with that?

Yes… a lot of things, actually.

Scientists A. A. Mills and R. Clift investigated this historical legend and published a study called 'Reflections of the Burning Mirrors of Archimedes' in the European Journal of Physics. They found that it took 440 men, each holding a $1m^2$ mirror, to just begin to ignite a tiny area of 1*0.5 m of a wooden hull placed at a distance of 50 meters. This means that if you don't want to try a giant mirror, you would need at least 440 mirrors and just as many men to aim them precisely at the target.

Even after all that effort, you would be far from obtaining the desired result. Supposing you get those 440 men to aim at a spot with surgical precision, you would still only be able to create a minor smolder, which could be easily quenched by saltwater (which is readily available to soldiers onboard a ship). Also, do you think that the enemy ship would be stationary and simply wait for your array of mirrors to inflict any serious damage on it?

Mythbusters, a popular Discovery Channel show, also tested if a ship could be burnt just by using mirrors, and concluded that first, it's an uphill task to focus multiple mirrors' reflected beams at a single spot. While you could achieve a temperature of a couple hundred degrees, it still won't be as hot and as powerful as to be able to burn an entire ship down.

All in all, it's practically impossible to burn a ship down by focusing sunlight on it through the use of mirrors. However, you can certainly blind, puzzle or inflict some burns on the skin of certain crew members onboard the enemy ship.Turns out that Archimedes' idea for this sort of assault on an enemy doesn't hold much water, but history is always told by the victors!

Which brings me to the following: It is quite possible that such weapons were used by the the warlords of the lighthouse with a consequential result that they were attacked in a warfare manner leading to destruction of the Tower.Or else there is no question of a peaceful lighthouse facing devastation.

REFERENCES

1. *Jeremy Hsu LiveScience Senior Writerhttps://www.csmonitor.com/Science/2010/0629/Archimedes-flaming-death-ray-was-probably-just-a-cannon-study-finds*

2. *Could Archimedes Really Destroy Ships By Focusing Sunlight Through Mirrors? Ashish 2 Apr 2016 (Updated: 29 Nov 2019)*

3. *Archimedes and the Burning mirror, Lee Krystek http://www.unmuseum.org/burning_mirror.htm*

ABOUT THE AUTHOR

Dr. Uday Dokras

The author has worked for 30 years in the human resources arena in India and abroad. He was Group Vice -President of MZI Group in New Delhi and has anchored Human Relations in Go Air and Hotel Holiday Inn; was General Manager-Health Human Resources at the Lata Mangeshkar Hospital amd Medical college. Is currently Consultant to Gorewada International Zoo,Nagpur and visiting Faculty at the Central Institute of Business Management and Research, Nagpur.

In Sweden he anchored HR in Stadbolaget RENIA, SSSB and advisor to a multi millionaire.

He has studied in Nagpur, India where he obtained degrees of Bachelor of Science, Bachelor of Arts(Managerial Economics) and Bachelor of Laws. He has done his Graduate Studies in labour laws from Canada at the Queen's University, Kingston; a MBA from USA, and Doctorate from Stockholm University, Sweden. Apart from that he has done a Management Training Program in Singapore.

A scholar of the Swedish Institute, he has been an Edvard Cassel Fund and Wineroth Fund Awardee.A scholar for the Swedish Institute for 5 years.

In 1984 he was involved with the Comparative Labour Law Project of the University of California, Los Angeles, U.S.A. He was also visiting lecturer there. In 1985 he was invited by the President of Seychelles to do a study of the efficacy of the labour laws of Seychelles.

Author of a book on a Swedish human resource law, his brief life sketch is part of the English study text book of 7 th Class Students in Sweden -“Studying English. SPOTLIGHT 7”- and 8 th Class students in Iceland - “SPOTLIGHT 8- Lausnir.”

His first book MBL Act on Co-determination at Work has been granted copyrighted by the United States of America,Library of Congress.

BOOKS Written

1. **Act on Co-determination at work-an efficacy study - 1990**
   Doctoral thesis published by Almqvist & Wiksell International, Stockholm,Sweden
   This is a first of a kind empirical study of both employees and business owners reactions of how efficiently a labour law was functioning in a country(Sweden).Adorns Stanford and Harvard University Libraries and granted Copyright by the Library of Congress,USA in 1990.

2. **Health Human Resource Management- 2006**
   A to Z of the Management of health workers starting from recruitment to training, development and enhancing their efficacy. Good book for all health care institutions as well as medical and nursing staff and students.

3. **Theme Park Human Resource Engineering- 2007**
   How the workers in theme parks deal with a complex environment and need to be managed in order to being out superior delivery of customer focused services helping in more footfalls at the same time not compromising on safety.

4. **Project Human Resource Management- 2008**
   Projects are cumbersome and their success rests not on the material but on the men who move it. Book deals with management ideas to spur project workers and staff to greater

delivery parameters**.**

5. **Creativity and Architecture -2009**
   Co-authored with Srishti Dokras, examines the parameters of creativity and how it will raise design quotients.

6. **Diffusion – Management and Design- 2009**
   Co-authored with Karan Dokras deals with a new and little known subject of Diffusion or how predator ideas enhance own value in a market where dominant players call the shots.

7. **Hindu Temples of Bharat,Cambodia and Bali- 2020**
   Enigmatic designs, huge structures, massive projects all done before the invention of cranes or bulldozers- the how and why of temples in Bharat,Nagpur,and the Far East. Biggest and most comprehensive book on the subject -452 pages.

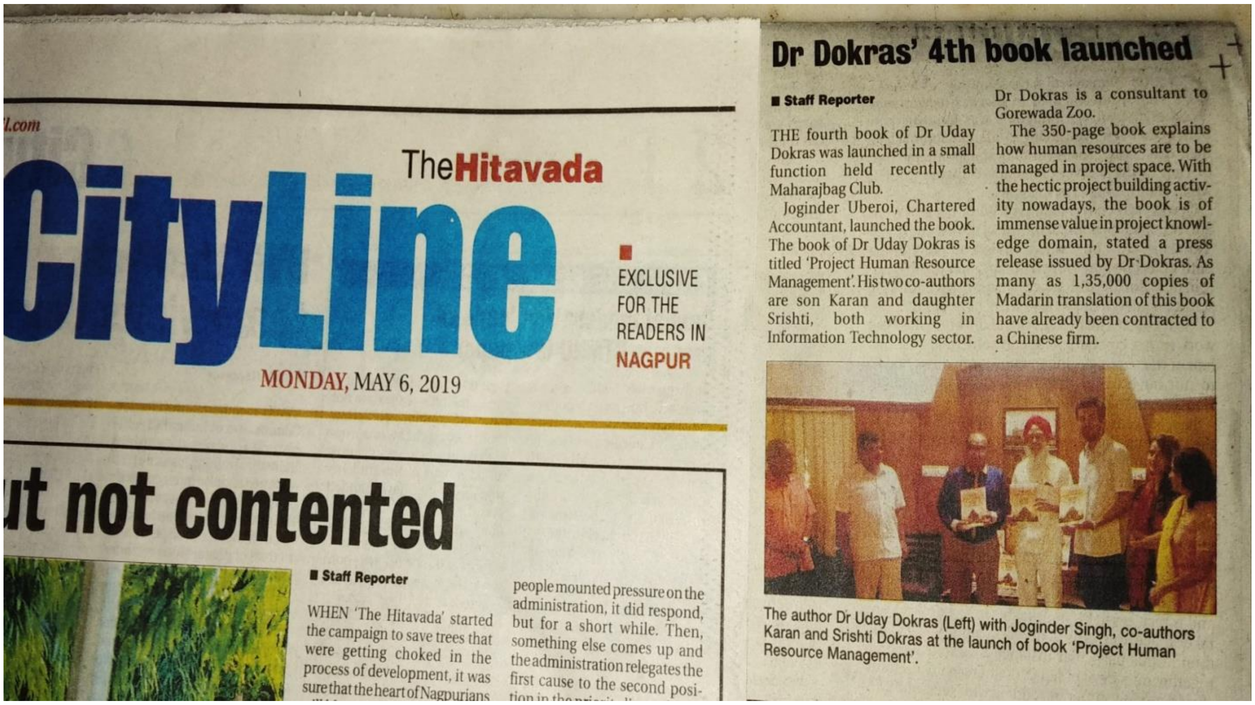
8. **Win Diet 2020**
   Diets and fads come and go but not this one-A diet and exercise plan that will help you to win over obesity,unhealthy lifestyles and make a dynamic YOU.Written by a 68 year old who has been diagnosed with a 26 year old's heart.

9. **Celestial Mysteries of the Borobudur Temple of Java- 2020**
   This amazing biggest in the world Buddhist temple was built with technology and ideas from India 1500 years ago using fractal geometry, Algorithms, Hindu temple technology and archeoastronomy**.** Read HOW it was done.

10. Celestial Mysteries of the Holy Flower-LOTUS-2020
    In Hinduism,Buddhism or Jainism the LOTUS acquires a unique place as a KING. Yet it is a mystery as to why?

11. Ancient world mystery is the Light House at Alexandria- the 7 th wonder of the Ancient World.. This book explains A to Z f the design and progeny

RESEARCH PAPERS 100 + most of them published on academia.edu



TheHitavada

CityLine

MONDAY, MAY 6, 2019

EXCLUSIVE FOR THE READERS IN NAGPUR

ut not contented

Staff Reporter

WHEN 'The Hitavada' started the campaign to save trees that were getting choked in the process of development, it was sure that the heart of Nagpurians

people mounted pressure on the administration, it did respond, but for a short while. Then, something else comes up and the administration relegates the first cause to the second posi-

Dr Dokras' 4th book launched

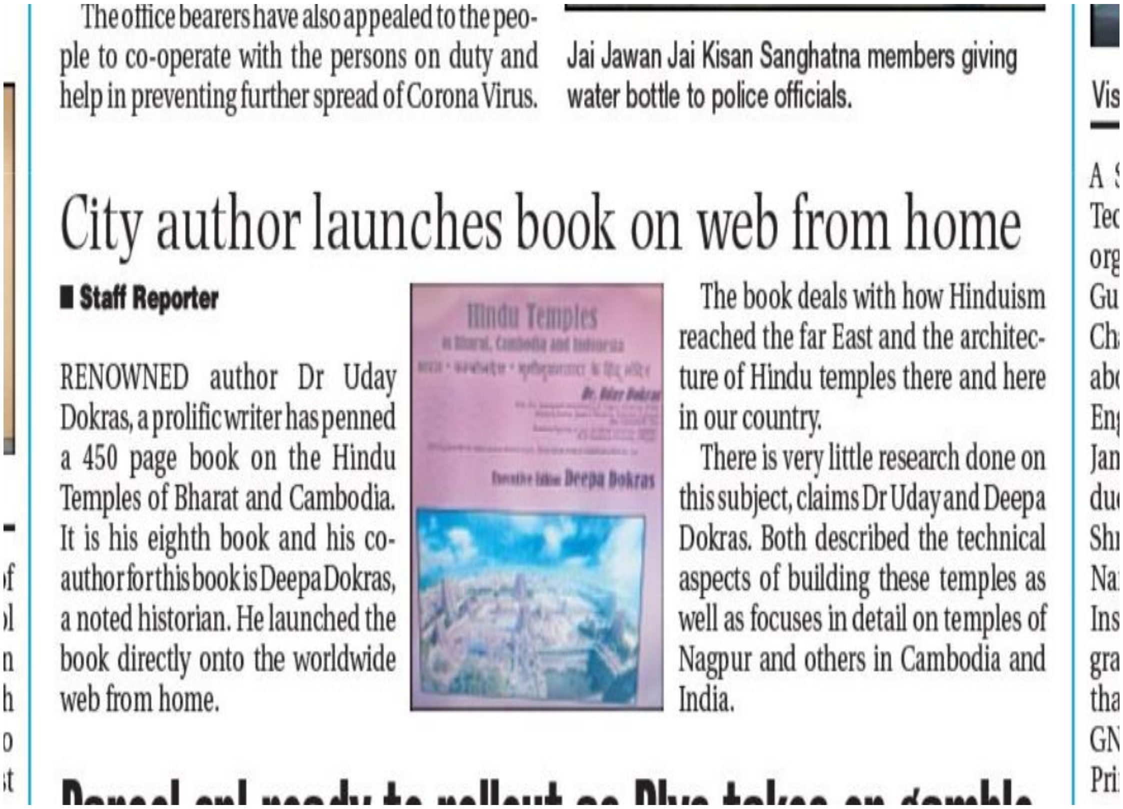
Staff Reporter

THE fourth book of Dr Uday Dokras was launched in a small function held recently at Maharajbag Club.

Joginder Uberoi, Chartered Accountant, launched the book. The book of Dr Uday Dokras is titled 'Project Human Resource Management'. His two co-authors are son Karan and daughter Srishti, both working in Information Technology sector. Dr Dokras is a consultant to Gorewada Zoo.

The 350-page book explains how human resources are to be managed in project space. With the hectic project building activity nowadays, the book is of immense value in project knowledge domain, stated a press release issued by Dr Dokras. As many as 1,35,000 copies of Madarin translation of this book have already been contracted to a Chinese firm.

The author Dr Uday Dokras (Left) with Joginder Singh, co-authors Karan and Srishti Dokras at the launch of book 'Project Human Resource Management'.



The office bearers have also appealed to the people to co-operate with the persons on duty and help in preventing further spread of Corona Virus.

Jai Jawan Jai Kisan Sanghatna members giving water bottle to police officials.

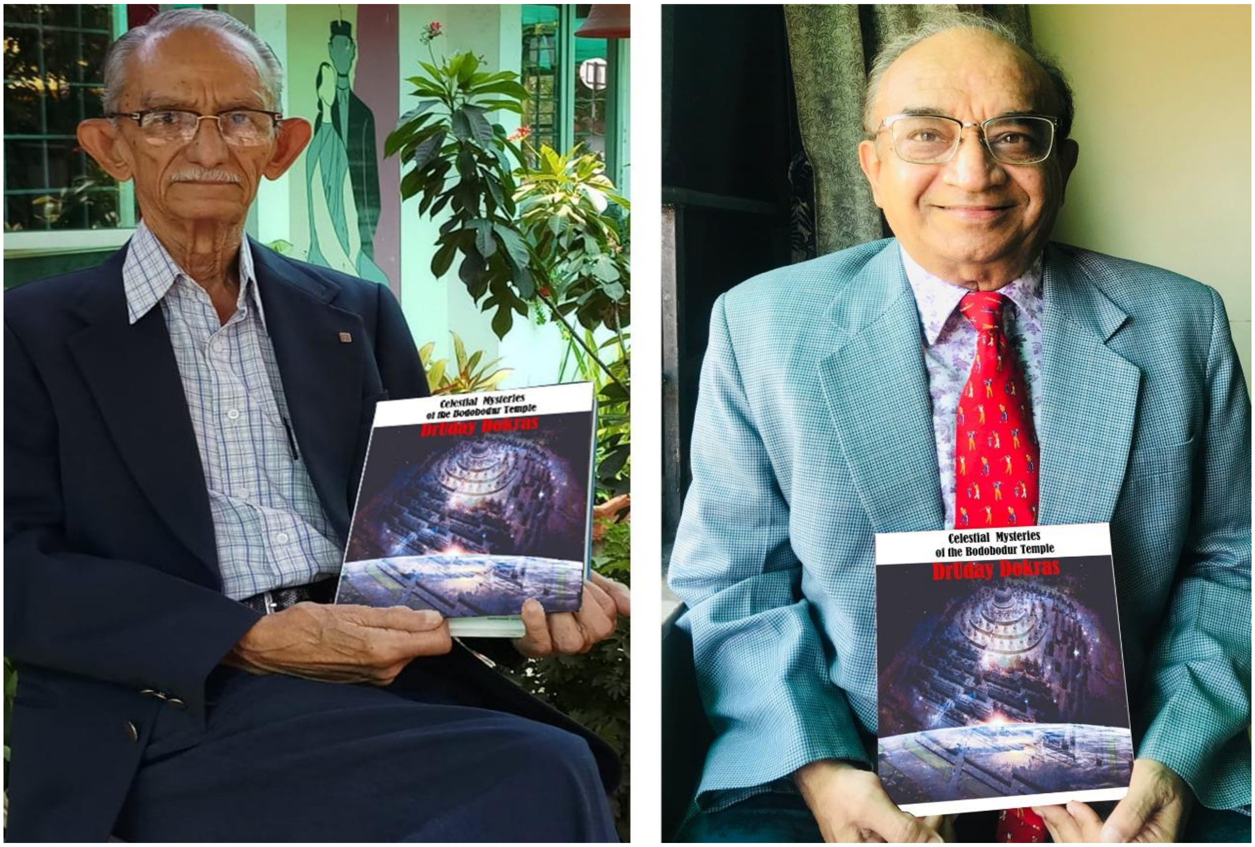
City author launches book on web from home

Staff Reporter

RENOWNED author Dr Uday Dokras, a prolific writer has penned a 450 page book on the Hindu Temples of Bharat and Cambodia. It is his eighth book and his co-author for this book is Deepa Dokras, a noted historian. He launched the book directly onto the worldwide web from home.

The book deals with how Hinduism reached the far East and the architecture of Hindu temples there and here in our country.

There is very little research done on this subject, claims Dr Uday and Deepa Dokras. Both described the technical aspects of building these temples as well as focuses in detail on temples of Nagpur and others in Cambodia and India.



Prof. S.A. Deshpande, President Indian Institute of Architects launched my book from home in Covid times.